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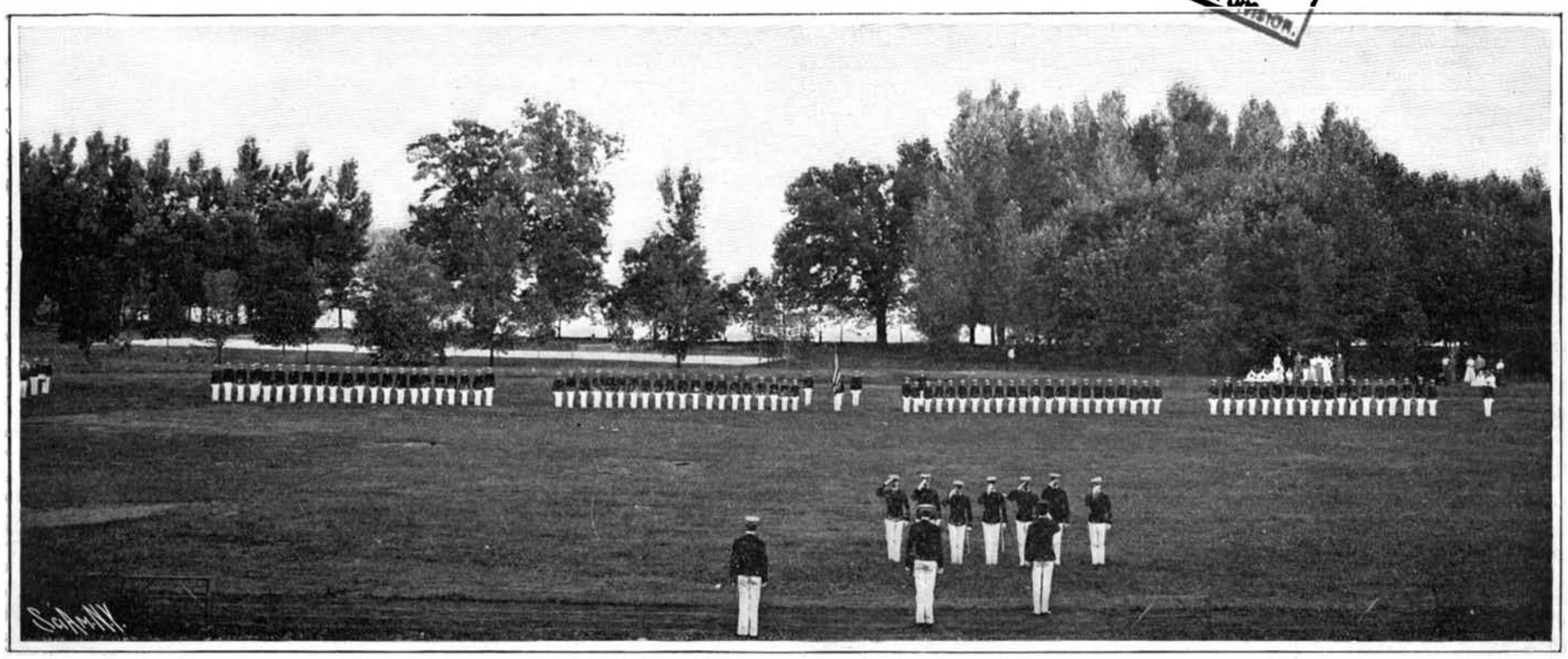
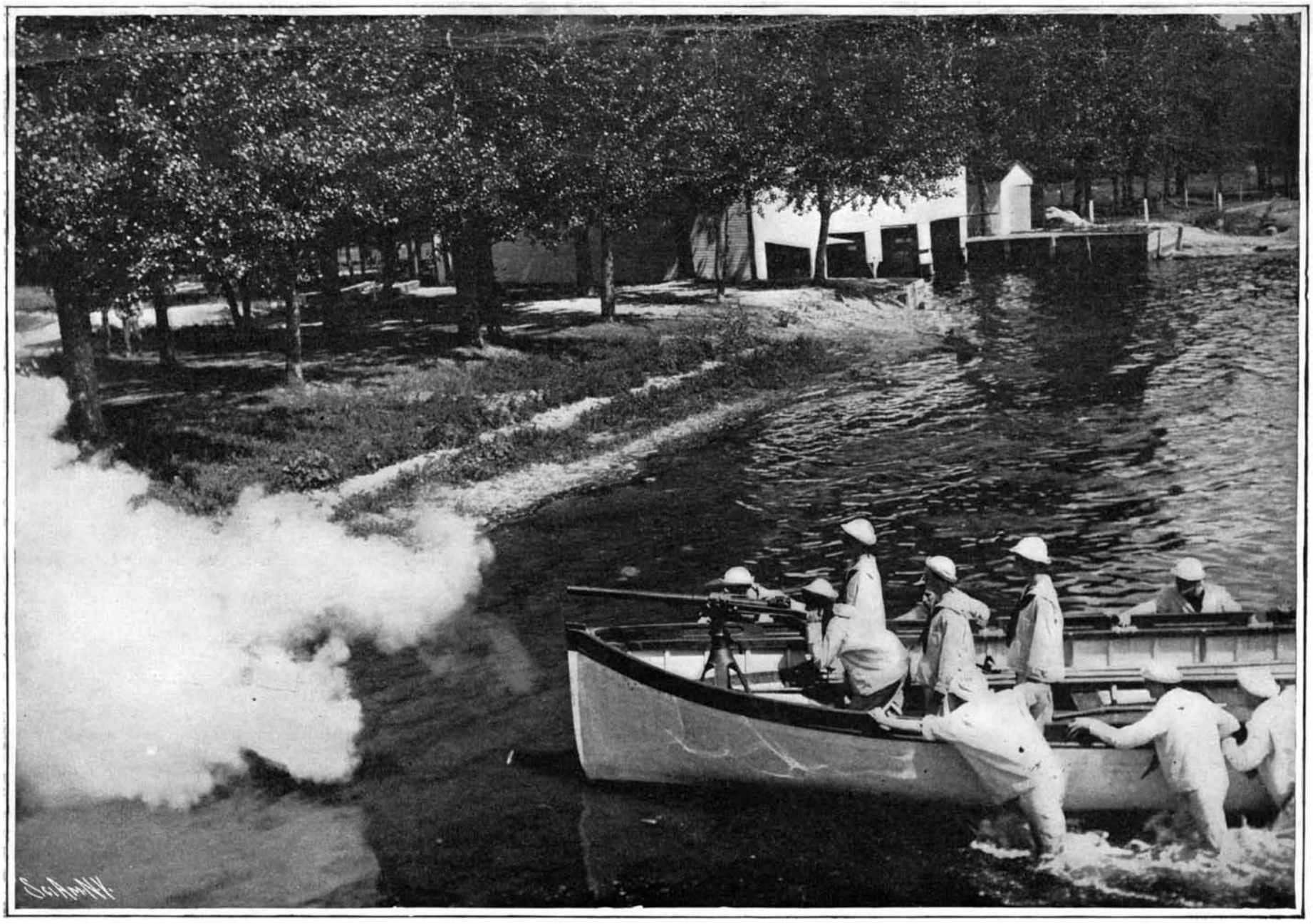
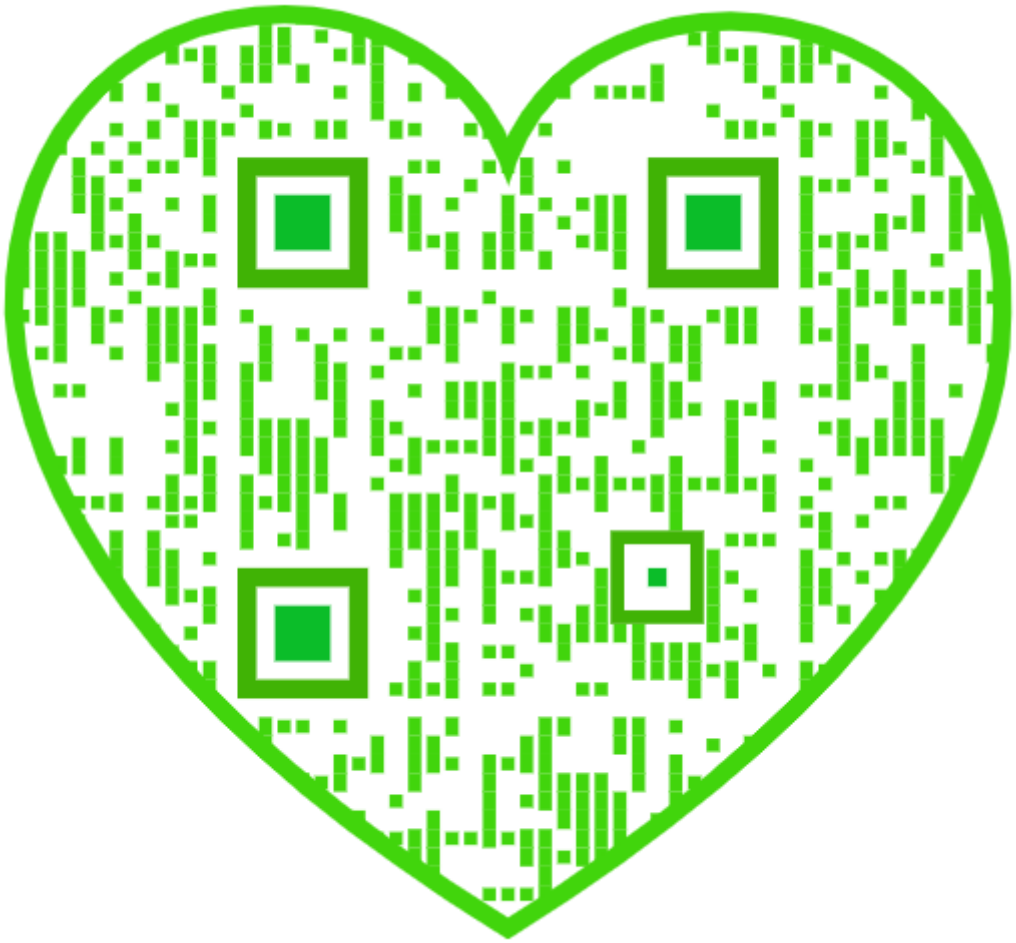


Evening Parade. Colors Are Lowered to the Salute of the Sentinel Gun and the Playing of the "Star-Spangled Banner."



As the Keel Touches Bottom the Cadets on the Thwarts Toss and Boat Their Oars, Leap Overboard and, Grasping the Gunwale, Rush the Lightened Cutter High and Dry on Shore.

MANNING OARS AND HALYARDS AS A SUMMER OUTING.—[See page 360.]



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ESTABLISHED 1845

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NEW YORK, SATURDAY, MAY 6, 1905.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

SAFETY OF THE GREAT ASSOUAN DAM.

The great success that has attended the operation of the Assouan dam, in extending the area of cultivable land in Egypt, recently led to the consideration of the question of raising the height of the dam by about 18 feet—an addition which would greatly increase the capacity of the reservoir. At the request of the government, Sir Benjamin Baker, who is responsible for the design of the Assouan structure, was requested to make an investigation, in the course of which the fact developed that the rush of water, passing under great head and high velocity through the sluice gates, had worn out a series of cavities in the bed of the river below the dam. The structure is built in places upon a rock of a somewhat friable character, and in order to secure a perfectly broad and solid foundation platform, a broad table or bench of concrete was laid in the river bottom, upon which the masonry of the dam was built up. At the time of its construction, it was realized that the scour due to the rush of water through the sluice gates must be provided against, and the concrete platform was extended for a certain distance, forward of the downstream face of the dam. Acting upon Sir Benjamin Baker's recommendation, the concrete platform will now be carried a further distance downstream, so as to make sure that the effects of scour can never work back toward the dam and endanger its stability.

Simultaneously with the investigation of the dam, there appeared in England an academic discussion by two college professors of the question of the stability of dams in general. They advanced a rather fanciful theory as to the probable line of failure of dams, which was quite at variance with accepted and well-proved engineering theory on this subject. The proposal to increase the height of the dam; the chief engineer's investigation of the structure; and the curious theories of dam failure, above referred to, offered an attractive coincidence for the reportorial sensation monger, who seems to be getting wonderfully well acclimatized in the field of London journalism; and the British public has been treated to whole columns of matter tending to prove that this costly engineering improvement is doomed to short life, if indeed it is not liable to be swept down the Nile Valley without a moment's warning.

As a matter of fact, the Assouan dam, so far from being in any danger of failure, has a margin of stability so great as to render it possible to add the 18 feet of height suggested, and still leave the structure proof against overturning, or rupture, for all time to come.

THE MANHATTAN BRIDGE SCANDAL.

When the present Bridge Commissioner of this city took office some eighteen months ago, he found confronting him what is perhaps the most urgent problem pressing for solution in this great city of New York; namely, the construction of a new bridge across the East River for the relief of the present overcrowded Brooklyn Bridge. The Bridge Commissioner makes no pretension to knowledge of bridge construction; but he called to his assistance, as chief engineer, a former employe of the Bridge Department, who was known to be bitterly opposed to all the work that had been planned for the construction of the bridge—work which had involved two whole years of careful preparation. The commissioner clearly understood that the appointment of this man meant the undoing of everything that had been done by his predecessor, and the subjecting of the city of New York to at least two years more of the disgraceful conditions due to the overcrowded condition of the Brooklyn Bridge. When the new chief entered once more the offices of the Bridge Department, he found on file a complete set of working plans for the new bridge—plans, by the way, which had been passed upon and unanimously indorsed by a commission composed of the most eminent bridge engineers in the United States. These plans had been drawn up in accordance with the most up-to-date design and practice for long-span bridges, and in their preparation special forms of construction had been adopted with a view to insuring speedy erection. The plans and specifications were in a complete condition, ready for the contractors to bid upon. Had bids been invited, contracts let, and the work pushed through with the zeal that the urgent need for the bridge demanded, the structure would, at the present writing, have been one-half completed, and the opening would have taken place within about eighteen months from the present date.

The obvious duty of the commissioner and his chief engineer was to push the bridge through to completion with all possible dispatch. It was a duty that they owed to the people of this city. Did they meet it? Not in the least particular. On the contrary, they deliberately subjected the city to a delay, which they knew positively would amount to not less than from eighteen months to two years, and which, as the event has proved, is likely to amount to not less than four years. Had the commissioner and his chief engineer followed the course which was dictated by the most elementary sense of fidelity to a great public trust, the Manhattan Bridge would have been opened in the autumn of 1906. As it is, New York will be fortunate if it is open by the year 1910.

The plans for the new structure were unceremoniously thrown aside. Why? To many of us the reason is not far to seek, when we remember that the rejected plans had been formulated under a previous administration, and that they had been designed by a former commissioner who had promptly discharged the present chief engineer for leaving his desk to criticise those plans in a public meeting. Of course, it would never have done to have alleged political or personal motives for the blocking of a great public utility such as this; and, consequently, the commissioner and his chief engineer had recourse to the ridiculous statement that the bridge, as designed, was faulty. In other words, the present chief engineer, whose knowledge of the science and practice of New York city bridge engineering has been confined to such work as has fallen to him in subordinate positions, and who has not a single engineering work to his credit that approaches this bridge in importance, undertook to set his judgment against that of an expert commission which included the acknowledged leading authorities on bridge engineering in this country. It would have been presumption of the most extreme kind had this single individual pitted his solitary and limited reputation against that of the acknowledged leaders in this great branch of civil engineering. But when he does this, as he has done, at the cost of an enormous amount of inconvenience and damage to the leading city of the United States, the presumption, we had almost said the cool impertinence, of the thing is beyond adequate expression.

What have the present commissioner and his chief to show for their eighteen months' work in the department? When they came into office the stone piers for the towers of this bridge were completed. Had the contract been let at once, these towers would to-day be finished to their full height; as it is, not a pound of steel has been built upon the piers, and their top surface is as barren of steel-work as it was on the day the commissioner took office. Not only have the towers not been commenced, but the new plans, if you please, are not even yet completed. So also with the superstructure, that is, the cables and the suspended roadway. Had the commissioner called for bids at once, the cables would by now have been partially erected; the steel for the roadway gotten out; and, indeed, the whole structure would have been in such a forward condition as to guarantee its opening by the autumn of next year. So again with the anchorages. Had property been at once condemned, the buildings removed, and contracts for construction let, these anchorages would, to-day, have been completed, or nearly so. As it is, no construction whatever has been done; and, by the way, thereby hangs a tale that tells so graphically the whole story of the attitude of the commissioner toward this bridge, and the full appreciation of that attitude by the contractors, that it is worthy of repetition. As soon as the contract for these two anchorages was let, it was the duty of the contractors to commence at once to pull down the houses that cover the site of the anchorages, in order to make a clear space for the excavators and the masons, and for the storage of materials. Did they do this? In the case of one of the anchorages, nothing of the kind was done. Instead, the contractor promptly rented all of the buildings covering the site, and forthwith sat down to play the rôle of landlord, knowing perfectly well that time was a minor consideration in the affairs of the present Bridge Department.

Surely in all the long history of maladministration of New York city's affairs, it would be impossible to find a parallel to this exquisite comedy.

In view of the fact that not even the plans are yet completed, and that a preliminary investigation of these plans renders it pretty certain that the bridge will cost some two million dollars more than one built on the rejected plans would have cost; in view of the further fact that the spirit of indifference pervading the Bridge Commissioner's office is so perfectly realized by the contractors, we do not hesitate to say, here and now, in answer to the many questions that reach us as to the probable time of opening of the Manhattan Bridge, that, if the construction be carried on under the present methods, it will not be opened to the public until the year 1910.

In view of the dangerous and disgraceful overcrowding on the Brooklyn Bridge, which the new bridge designed to relieve, it must be confessed that the apathy of the Bridge Department has reached a point where it calls loudly for action on the part of the mayor. Mr. McClellan has the confidence of the New York public; for he has shown that he is solicitous for its best interests. We believe there is no direction in which he could further those interests so materially as by a searching investigation into the causes of the inexcusable delay in building the Manhattan Bridge.

TEXTILE FABRICS OF PAPER.

Garments made of paper have long been used in eastern Asia, but only in default of other clothing or on special occasions. In western countries the only articles of dress made of paper, until recently, were collars, cuffs, and shirt bosoms, that is to say, articles which are usually starched. Now, however, numerous inventors are endeavoring to introduce woven paper fabrics.

Some time ago an Italian, Prof. Zanetti, devised a method of making fine and strong yarns by twisting very thin silk paper, cut into strips about one-tenth of an inch wide. As yet these yarns are used only for wicks of wax candles and in the manufacture of incandescent gas mantles.

A greater advance has been made in Saxony. Here also narrow strips of paper are spun, by a process patented by Claviez & Co. Paper and cotton are also spun together, so that in the finished yarn the paper envelops the cotton. These yarns are used as fillers, in conjunction with cotton warp, in weaving drillings suitable for toweling and summer waistcoats, trousers, and skirts.

Heavier and warmer cloth is made by combining paper and woolen yarns. The fabric is cream colored, and may be washed repeatedly without injuring the surface. It is well adapted for tennis and lounging suits. Sufficient cloth for a jacket, waistcoat, and trousers costs only ten marks, or $2.50, and still cheaper garments are made for laborers. This new product is named xylolin.

For such use, however, raw materials even cheaper than finished paper are sought. Spinning mill refuse, consisting of very short smooth fibers that cannot be spun, goes, as a rule, to the paper mills. Many attempts to utilize this material have been made in spinning mills, and experiments in spinning it wet suggested the idea of further comminuting the short fibers in paper machines. In this way a thin fibrous paste was produced. This, when poured on sieves, yielded a thin soft paper which, partially dried and cut into narrow strips, could be spun into yarn. Other cheap paper stock; including wood pulp, can be converted into yarn by a similar process, and so spinning and paper making meet.

One brand of these cellulose, or wood pulp, yarns is called silvalin. During the last ten years many similar processes have been patented. The manufacture is still in the experimental stage, but definite progress has been made, and the industry has a promising future before it.

Prof. Pfuhl, of Riga, recently published a technical treatise on processes and results thus far attained.

The first practical requirement of yarn is tensile strength, which is indicated by the maximum length that will support its own weight. Cotton yarn has an average breaking strength of from 43,000 to 47,000 feet, that is, it will just break with the weight of a skein of that length. For dry-spun flax the figures are 39,000 to 41,000; for wet-spun flax, 41,000 to 49,000; for ramie, 37,000 to 40,000; for jute, 32,000. Wood-pulp yarn is much weaker than any of these. The greatest strength yet attained is 28,000, the average from 18,000 to 23,000. The strength, however, may possibly be increased by improvements in manufacture and admixtures of other material.

Resistance to the action of water is another important quality in which fabrics differ greatly. Prof. Pfuhl gives an example from experience. A lighter laden with grain in jute and canvas bags sank in the Volga. Thirty-six hours afterward the canvas (flax) bags were raised with their contents, but the jute bags had disintegrated so that the grain which they had contained was lost. Jute yarns, however, withstand several hours' immersion, but wood-pulp yarns fall apart after very brief soaking.

In a test of density and porosity, it was found that raw sugar could be sifted readily through wood-pulp cloth weighing 462 grammes to the square meter, while lighter jute cloth allowed only traces of sugar to pass.

No very fine yarn has yet been spun of wood pulp. The thickness of yarn is indicated by the number of units of length contained in the unit of weight. The metric number, designated by the symbol N^{mt}, represents the number of meters in a gramme; the English number, N^{B}, gives the number of skeins of 840 yards in a pound. The finest pulp yarn made is N^{mt} 13, or N^{B} 7.68.

From all this it appears that pulp yarns, at present, have a limited field of usefulness, and compete with other yarns only where great strength and compactness are not necessary and the action of water is excluded. In combination with jute, flax, or cotton yarns, however, they yield reasonably strong fabrics which can be washed repeatedly.

In this way are made towels and wash cloths for every purpose, mattress coverings, and bed and table "linen." The finest wood-pulp yarns are combined with wool and cotton in furniture coverings, carpets, curtains, tapestry, canvas, and clothing. These fabrics, which are very cheap, may be dyed or printed. New uses will probably be found even for cloth made entirely of pulp after further experiment and acquaintance.

As yet all these fabrics bear the stamp of inferiority, but who can foretell how greatly they may be improved?

"Wood pulp," Prof Pfuhl observes, "may advance in textile manufactures as it has in paper making, which some prophets said it would ruin. Now eighty per cent of our paper is made of wood pulp."

THE NATIONAL ACADEMY OF SCIENCES.

BY MARCUS BENJAMIN, PH.D.

The annual or stated meeting of the National Academy of Sciences was held in Washington city on April 18, 19, and 20, 1905, in the United States National Museum, under the presidency of Dr. Alexander Agassiz. The morning sessions were devoted to the business of the Academy, while the afternoons were occupied in the reading of papers.

These papers, seven in number, were all highly technical, and of them the first, "The Mechanical Equivalent of Light," by Edward L. Nichols; the second, "The Effects of Alcohol upon the Circulation," by Dr. H. C. Wood and Dr. Daniel M. Hoyt; and the fifth, "The Geographical Cycle in an Arid Climate," by William M. Davis, were read on the afternoon of April 18. The remaining papers were presented on the afternoon of the twentieth; they included "Resequent Valleys," by William M. Davis; "A Catalogue of Spectroscopic Binary Stars," by W. W. Campbell; and "Discovery of the Sixth and Seventh Satellites of Jupiter and Their Preliminary Orbits," by C. D. Perrine, which were read by title only, while "The Expedition of the U. S. Fish Commission Steamer 'Albatross,' in Charge of Alexander Agassiz, in the Eastern Pacific, Lieut. Commander L. M. Garrett Commanding," by President Agassiz, was read, and was of unusual interest. It will be remembered that on a previous occasion the scientific world has been fortunate in securing the results of a similar expedition in the Pacific Ocean, made under the direction of Mr. Agassiz. At this meeting he described that portion of the eastern Pacific Ocean lying west of northern South America, and which, from the dredgings, seemed to be largely of volcanic origin, as was apparent from the many nodules of manganese which were dredged. These peculiar nodules are more common in that part of the Pacific than elsewhere, and it may be said in passing that they are seldom found in the Atlantic Ocean. He described with much detail the depths at which the various dredgings were made, and outlined the contour of the ocean bed, which is known to geographers as the Albatross Plateau. Of considerable interest was the announcement of his finding numerous so-called "deeps," or hollows, which were found along the west coast of South America. The fauna of this territory was described in general terms and he found a tendency on the part of the animal life of the southern world to penetrate as far north as the Galapagos Islands. The fauna from the Panamic region extends down as far south as this same region. The paper was listened to with considerable interest. While only an outline of the work accomplished was presented, still much remains to be done in the way of working up the material obtained from the dredgings, which, of course, will be referred to the various specialists by the authorities of the Bureau of Fisheries.

The afternoon of April 19 was devoted to a visit to the buildings and plant of the National Bureau of Standards of the Department of Commerce and Labor, which, under Prof. Samuel W. Stratton, is doing some excellent scientific work in the way of securing instruments of all kinds of standard value. The business sessions were, for the most part, secret and of a routine character. The principal element was naturally the election of new members, and, as is the custom, five scientists were added to the group of the great men of science who constitute the official scientific advisers of the government. The new members chosen were: Michael Idvorski Pupin, who holds the chair of Electro-Mechanics in Columbia University, New York; Arthur Amos Noyes, Professor of Theoretical Chemistry in the Massachusetts Institute of Technology; John Casper Branner, who is Vice-President and Professor of Geology in Stanford University, California; William Henry Holmes, Director of the Bureau of American Ethnology in Washington city; and William Henry Howell, Dean of the Johns Hopkins Medical School, Baltimore, Maryland. The Academy also agreed upon the award of the Barnard medal, but the name is withheld from the public until it shall be announced at the Commencement of Columbia University in June.

OUR HERITAGE OF THE MECHANICAL ARTS.—III.

BY ALEX. DEL MAR, M.E.

Archimedes discovered the means of determining the specific gravity of ponderous substances; he constructed a crane so powerful that it could lift a loaded ship entirely out of water; he invented the screw-pump which bears his name; he erected great polished mirrors, which, by concentrating the rays of the sun, could set a ship on fire at the distance of a bow-shot. The knowledge of this phenomenon, coupled with the manufacture of glass, mentioned below, the use of silvered and gilded glass mirrors, and of globular glasses used for kindling a fire, all of which are described by Pliny, could scarcely have failed to suggest the reflecting telescope; and notwithstanding Beckmann's objections, this invention, either with or without lenses, must be added to the achievements of the Alexandrian age. The fact that an entire poem was engraved upon a grain of rice, and that artificial objects were made so small that their parts could not be observed with the naked eye, is almost conclusive with regard to lenses.

Eratosthenes invented the armillary sphere; Ctesibius invented pneumatic and hydraulic machines; and Hero of Alexandria constructed a steam engine, which was employed to open and shut the ponderous doors of a temple. Ptolemy Philadelphus planned a canal 62 miles long, 100 feet wide, and 40 feet deep, to unite the waters of the Nile and the Red Sea, and actually completed 37½ miles of it; Nicator Seleucus planned a canal to connect the Euxine and Caspian Seas; and Demetrius Poliorcetes still another one to make an island of the Morea; while Posidonius was bold enough to assert that the coast of India could be reached by sailing due west from Gaul. To this opinion Pliny responded: "I do not suppose that the land is actually wanting, or that the earth has not the form of a globe; but that on each side (of the known lands) the uninhabitable parts have not been discovered." Yet seventeen centuries elapsed before the voyage was actually made. Dicæarchus, who was a pupil of Aristotle, had long before held a similar opinion, and Pliny only repeats it where he says: "We maintain that there are men dispersed over every part of the earth; that they stand with their feet turned toward each other; and that the vault of the heavens appears alike to all of them." That the center of the earth is the center of terrestial gravity, was the natural corollary of these views, and, as such, it was thus explicitly laid down: "Hence it follows that all the water from every part tends toward the center, and because it has this tendency, it does not fall." And "It is to the glory of the Greeks that they were the first to teach us this, by their subtle geometry." (Pliny ii, 48, 65, 67, 112; iv, 5; vi, 12, 21, 33, 34; vii, 38.)

The loadstone was another discovery of the Alexandrian age. Its power to attract iron became notorious and even the distinction between the opposite poles of a magnet, though not commonly known, was evidently observed and utilized. Pliny cites several instances of the attraction and repulsion thus exerted. Timochares of Alexandria erected a vaulted roof of loadstone in the temple of Arsinoë, from which he designed to suspend an iron statue of the princess of that name, when the death of the king interrupted the work. Petroleum was also discovered at Samosata, in Commagene, near the source of the Euphrates. It was employed by the mountaineers to defend their city against Lucullus, whose soldiers by its agency were burnt in their iron armor. This was the origin of the dreaded Greek fire which in after ages became so famous. The manufacture of glass was carried to great perfection at Sidon, whence it spread to Venice, and thence deposited some of its most beautiful and delicate remains in the Glastonbury fens of Britain, whence they have recently been exhumed. Flexible glass belongs to the age of Tiberius, and should be mentioned among the inventions of the Romans.

The diamond drill is another product of the Alexandrian age. The adamas, or diamond, was first brought from India, but without the knowledge of cutting or polishing it. This art, so far as the West is concerned, appears to have originated in Damascus, whence, in spite of some ingenious but erroneous verbalisms suggested to account for its name, the latter undoubtedly derived its origin. This art is plainly alluded to where Pliny says: "In all cases precious stones may be cut and polished by the aid of adamas." And the diamond drill is suggested where he says: "The particles of adamas are held in great request by lapidaries, who inclose them in iron, and are enabled thereby, with the greatest facility, to cut the very hardest known substances." To corroborate this inference, an actual diamond drill, together with the porphyritic core cut by it, was, only a few years ago, found in one of the Egyptian quarries, and has been assigned by the finder to the Ptolemaic or Alexandrian age. (Pliny ii, 98, 108; xxxiv, 42; xxxvii, 15, 76.)

The manufactories of military weapons at Athens furnished numerous states with their supplies. Iron had now become common, while steel was scarce and dear. Among the odd commodities cited is an iron sideboard, costing less than $7.50 in weight of silver, that is, counting the drachma as equal to about 25 cents. This seems to prove that the sideboard must have been of cast iron and somewhat light of weight. Among the other prices quoted are $170 for a suit of steel mail and $1.80 per dozen for sailors' needles. The organization of commerce took its rise in this age. Banks and other credit institutions arose; money was lent on bottomry and other security; foreign consuls (proxenoi) were appointed; a public mart or exchange and a bonded warehouse were established in the Piræus; a trade in scriptures and tracts was organized; and books were even hawked in the theaters; the imports and exports were regulated; and trade corporations authorized, with liberty to make by-laws.

Although the scientific attainments of this era do not strictly come within our present scope, yet they are so intimately connected with the mechanical arts, and are themselves of such great interest, that at least the most prominent of them deserve some mention. The precession of the equinoxes, which had been noticed by Heraclitus, was confirmed by the numerous observations of Timocharis and Aristyllus, and popularized by Hipparchus; the celestial sphere was constructed and described by Eudoxus; and the Julian year of 365¼ days, though not established by law until the Roman imperial era, was determined by the Greeks of the Alexandrian age. Meton had computed it at 365d. 6h. 18m. 57s.; Callipus reduced this to 365d. 6h.; while Hipparchus, with increased precision, fixed it at 365d. 5h. 55m. 12s.—the nearest approach to the fact until a very recent age. To attain so exact a result, the clepsydra, or water-clock, of Babylon, was indispensable.

Our heritage of the mechanical arts from Rome is so ample that it cannot be compressed within the limits of the present article. It may be claimed with some truth that had Pliny's work been lost, the Renaissance would have been strangled at its birth and the Elizabethan age robbed of its splendor. Almost every art that sprang up after the discovery of America owes its origin to the ancient world, and to that knowledge of it which was preserved in the classical works, but especially in Pliny's "Natural History." The intervening period of fifteen centuries added but two important arts to the mechanical resources of the world—gunpowder and printing; and both of these were borrowed from the Orient. Felted paper, in default of which printing could scarcely have attained more than a stunted growth, was brought into the West in the eighth century by the Arabs of Samarcand. Gunpowder and firearms, without which Cortes and Pizarro could not have subdued, enslaved, and plundered America, had a similar origin; they were brought into Europe by the Arabs. Almost everything else that contributed toward the civilization of the sixteenth century came from classical antiquity. So far as the mechanical arts are concerned, the dark and middle ages produced substantially nothing.

SCIENCE NOTES.

The Soil of the Shari and Lake Chad Territory.—Samples of soil procured by the Chevalier scientific mission have been analyzed by Hébert and found to be rich in nitrogenous matters, but almost completely lacking in phosphates, lime, and magnesia. Although the soil is in general poor, coffee and cotton can be raised. A rich iron ore is found, which is exploited by the natives by crude methods, but with a production of iron in good quantity.

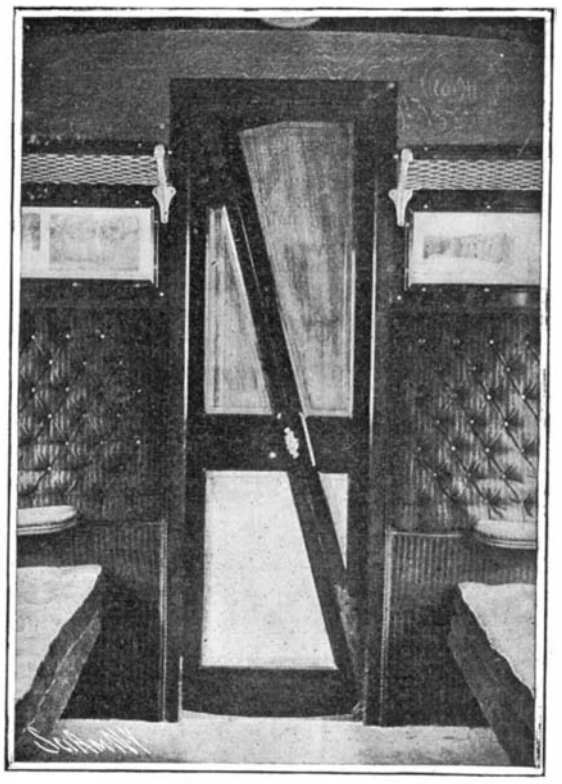
The earthquake which recently occurred in India was duly recorded upon the instruments at the various seismic stations throughout Europe, but only those at the French station at Val Joyeux, near St. Cyr, are identified with one particular shock. On April 4, between 1:10, 1:19 A. M. and 1:37 A. M., these instruments were violently affected. It was precisely at this time, which represents 6:20 A. M. Lahore time, that Lady Curzon was awakened by falling masonry. This interesting fact and identity was reported to the French Academy of Sciences by M. Mescart.

A NOVEL BALANCED DOOR.

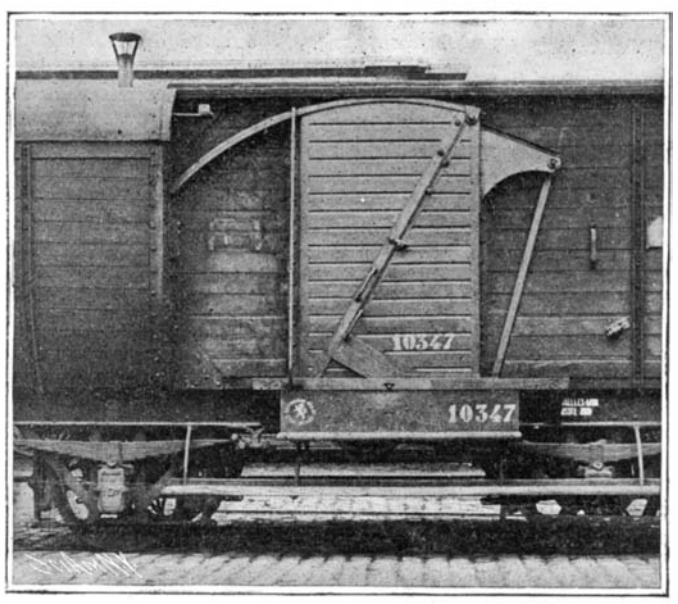
It would seem that there could be no further field for invention in so long used and commonplace a device as a door. Yet a Belgian inventor, Mr. Joseph Henri Dierickx, has recently produced a door which is a radical departure from any type heretofore used. It consists of two leaves, which are so pivoted that they will swing into partitions as the door opens, leaving an entirely clear passageway. Thus, the new doors partake of the advantages of both the hinged type and the sliding type, while avoiding their objectionable features. The common, hinged door has heretofore been considered the most satisfactory type where space allows of its use, because of the ease with which it can be swung open. It will not jam except in the unusual event of the door frame settling and thus becoming distorted. But it requires considerable space which, in many instances, cannot be spared. In street cars, for example, a door of this sort would be constantly blocked by passengers standing in the aisles and on the platforms. Then, too, if the door is not latched when closed, it will spring open at every lurch of the car, or be blown open by drafts. The sliding door, while it overcomes these objections, is nevertheless not perfect. The rollers on which it travels are too apt to slip off the track, causing the door to stick and jam. Mr. Dierickx's door is admirably adapted for street-car use, because it overcomes all the objections above noted. It is, furthermore, specially useful for freight cars, possessing the advantage that it cannot slide open under the jar of cars bumping together. The new door is formed of two triangular leaves which, when the door is closed, meet on a diagonal line of junction. The leaf which is largest at the top is pivoted at the lower corner, and the other leaf is swung from a pivot above the center of the doorway. A rod connects the two leaves in such manner that when either one is swung in a certain direction, the other will swing in the opposite direction. Thus, in opening the door, it is not necessary to seize both leaves and move them, for if either leaf is moved into or out of its pocket, the other will automatically move in harmony with it. The two leaves are also so connected that they counterbalance each other, and they are controlled in their movements by suitably grooved guides, in which they travel with a minimum of friction. No rollers are necessary.

Aside from its use for street and railway cars, this door will be found useful for private houses, hotels, ships, etc. In fact, its uses are unlimited, for it will operate in the horizontal plane, as well as in the vertical, and may, therefore, be used for windows, transoms, and the like. The peculiar shape of the door is apt to strike one as awkward at first, but this is due mainly to the fact that we have always been accustomed to rectangular doors. There is no reason why a diagonal door should not be as artistically arranged as any other. It will certainly afford architects an excellent opportunity to develop new and striking designs.

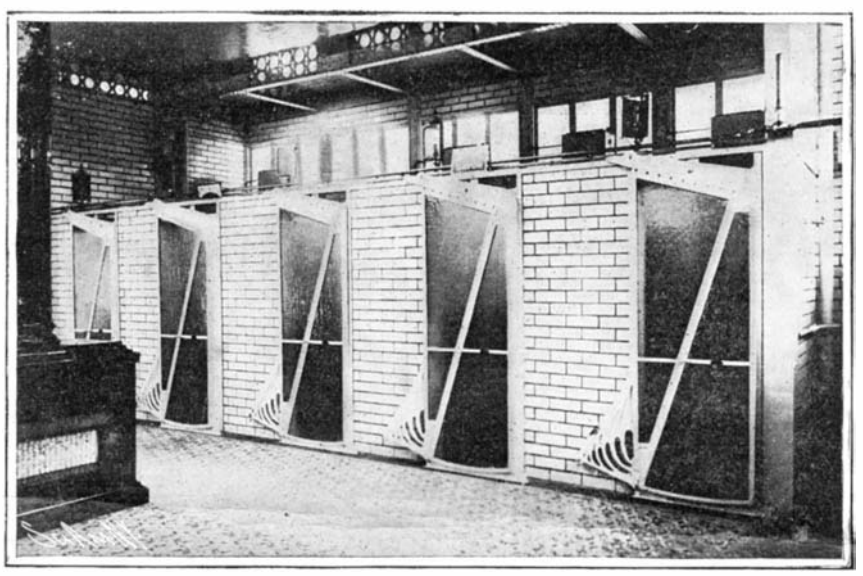
The counterbalancing feature of the door is one of the strongest points in its favor. A striking illustration of this was to be seen at the St. Louis Exposition, where a door of this type was used at the entrance of the Belgian pavilion. The door weighed 1,700 pounds, yet it could be opened by the pressure of a single finger, and it was never out of order during the entire season.



A Passenger Car Equipped with the Novel Balanced Door.



The Balanced Door Applied to a Freight Car.



The Public Baths at Brussels Fitted with the Balanced Doors.

MANNING OARS AND HALYARDS AS A SUMMER OUTING.

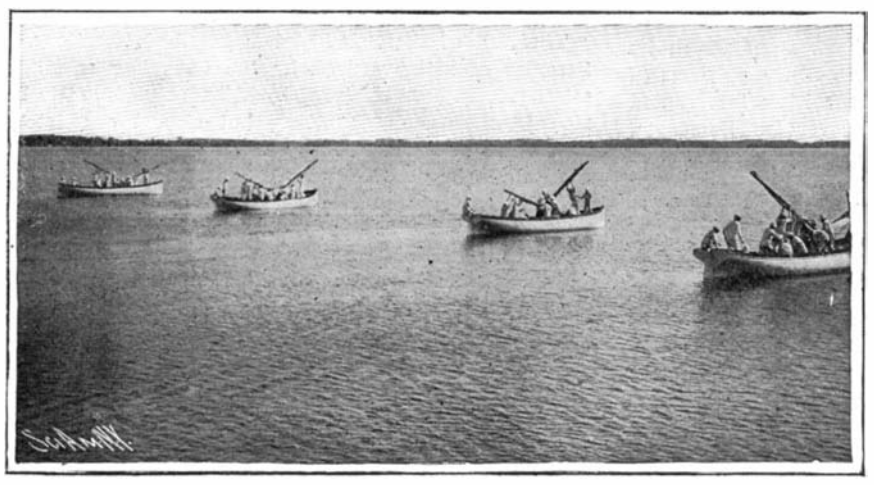
BY MAJOR L. R. GIGNILLIAT.

Something of the soldier's training has been welded into many schools. Not so with the sailor's. There are miniature West Points in almost every State, but schools modeled after Annapolis are not so easy to find. Were you to look for such a school in the most likely place, on the Atlantic or Pacific seaboard, you would seek it in vain. As a matter of fact, the only spot at present where you will find the combination of jackie and schoolboy is on an inland lake in a Western State, on Lake Maxinkuckee, at Culver, Ind. Nor is even this an all-year-round affair, but a summer school that contents itself with a brief eight weeks' session, in which man-of-war cutters play a more prominent part than classrooms; and in which the hardening of muscles, and the getting of a healthy coat of tan, take precedence over even such things as Latin and Greek.

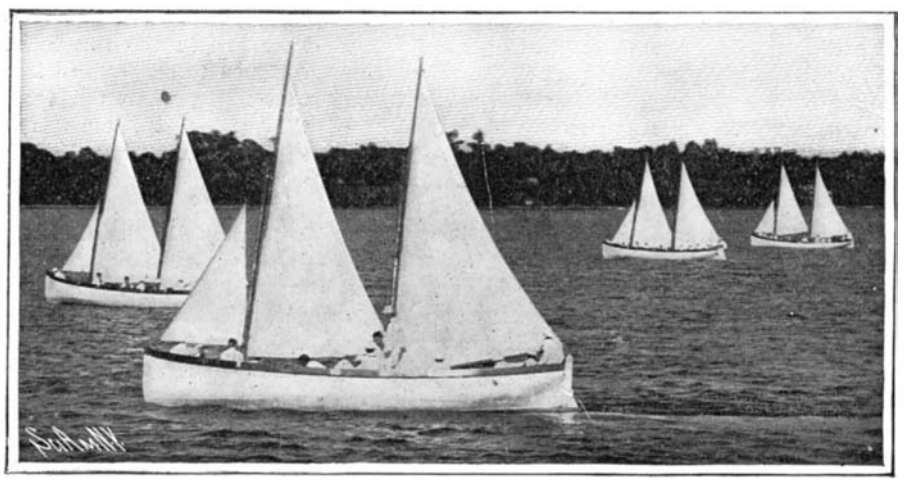
But despite its briefness, it is a session which amply justifies itself by the wealth of refreshment it affords the tired school-boy. It commends itself also to Uncle Sam by reason of the interest in the navy it arouses among the Western youth, and because the training they receive should make of them good material for officers of the naval militia. In fact, the Navy Department has sent out to this little Western lake an equipment of man-of-war cutters similar to those used in the boat drills of the midshipmen at Annapolis, and has lent Hotchkiss guns and other expensive equipment.

It is not in keeping with the hustling spirit of to-day that a boy even in summer time should spend three long months without aim or purpose, and so summer camps and other forms of organized vacations have come into existence. But it

A Water Tilting Match.



"Up Masts."



Cutter Drill under Sail.

MANNING OARS AND HALYARDS AS A SUMMER OUTING.

is doubtful if any of these make such a strong appeal to a boy's natural tastes, or give him more wholesome refreshment, a browner skin, or harder muscles than this naval course.

Certainly, boys could not enter into a thing with keener zest and more enthusiasm than is put into the manning of oars and halyards by the cadets of Culver Summer Naval School. Even an old man-of-war's man would not disapprove of the seamanly way in which they get up masts and make sail, or of the precision with which they handle their oars, and of the long, steady stroke with which they make the big cutters fairly jump through the water.

Under any conditions a boy loves to row and sail, but possibly the secret of the extra enthusiasm of the Culver lads lies in the appeal that a real man-of-war cutter makes to the love of romance inherent in every boy; for are not these cutters the landing boats and messengers of the navy? Were they not used in cutting the cable at Cardenas, and in landing troops in Cuba, and in fact would not the history of our navy be incomplete without them?

The nautical appearance of the cutters, with their spotless paint and shining brasswork, and of their canvas-clad crews, also lends interest to the work. And, besides, a cutter drill under oars, or sail, is a far different thing from plain rowing or sailing. Under oars a pennant flies in the bow, and the United States colors from the stern. The masts are unstepped, and with sails neatly made up, are laid along the running board. One cadet perched in the coxswain's box handles the tiller and gives the orders to the ten cadets at the oars. When he commands "Toss!" the ten oars must spring skyward as one; when he commands "Let fall!" they must strike the gunwale with a single thud. And these oars are no light spoon-blade sculls, but are fourteen feet of heavy ash, veritable telegraph poles. Doubtless were you to try to toss one yourself, without knowing the knack of it, it would play seesaw with you over the gunwale. When the individual crews have learned how to give way together, and to back water port and give way starboard, in other words, to handle their cutters quickly in response to commands, the cutters are drilled together. Various combinations of gayly-colored signal flags are displayed at the mast of the instructor's launch, and in response to these the cutters maneuver into various formations, just as the ships of a squadron would do on signal from the flagship. All of this is interesting enough; but during the race under oars, a feature of almost every drill, no cadet ever remembers that handling a fourteen-foot oar is anything like work. Each youngster bends to his oar as if his life depended upon his cutter's being first, and the coxswain calls stroke and excitedly urges them on to greater effort, yet with all this exertion the victorious crew never fail to have enough wind left at the finish to announce their triumph with a lusty cheer.

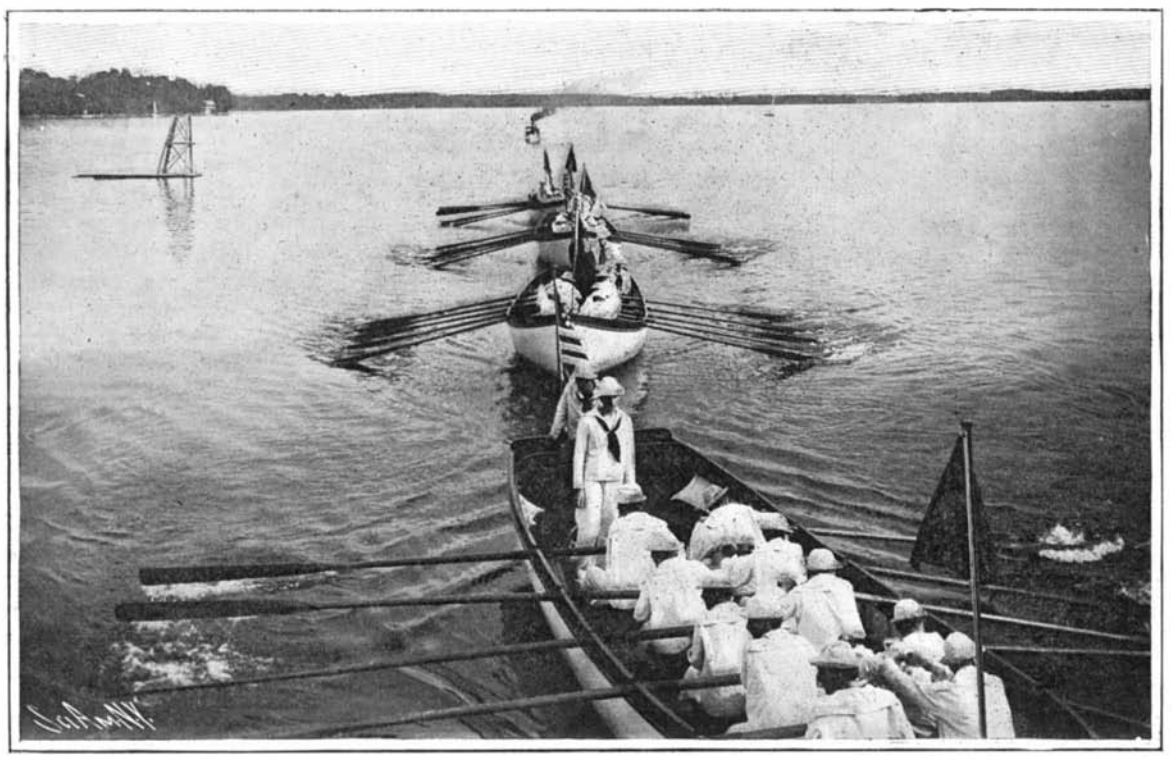
For the drill under sail, oars are tossed and boated, and at the command of "Up masts!" each cadet springs to his place, the masts are whisked from the thwarts and stepped, topmasts raised, shrouds made fast and sheets hauled flat aft, and in veritable "presto change" fashion the ten-oared rowboats have taken unto themselves wings, and are scudding over the lake. A cadet tends the main sheet, another the fore sheet, another the jib. They must not belay their sheets, but must stand ready to let them fly the instant the coxswain commands. Another cadet in the bow keeps a bright lookout ahead. The rest of the crew keep down in the boat, climbing to windward when the coxswain wants a shift of ballast, and ready, at any instant, to lend a hand in brailing up or lowering away.

Then the cadets are taught besides to splice and to tie knots, and the other things of marlinspike seamanship. They learn to box the compass, and are initiated into the mysteries of the sextant, and of "shooting the sun." But the most interesting drill of all perhaps is when the Hotchkiss rapid-fire guns are mounted in the bows of the cutters, and each man at the oars has a rifle beside him on the thwart and a goodly supply of blank ammunition. A landing is to be made, and an attack on an imaginary enemy on shore. The Hotchkiss gun crew begins to pound away at once, shot after shot is fired; each time the cutter staggers between the recoil of the gun and its own momentum. Finally, as the cutters approach the shore and the keels grate on the bottom, the cadets on the thwarts quickly toss their oars, boat them, spring overboard, and, clinging to the gunwale, rush the cutters high on shore. Then they grasp their rifles and form a long skirmish line, popping away, and advancing determinedly on the enemy. When he has been successfully repulsed, in other words, when the blank ammunition is all expended, they shove off again, and as the boats float free, they clamber over the gunwale, dripping wet, and thoroughly happy.

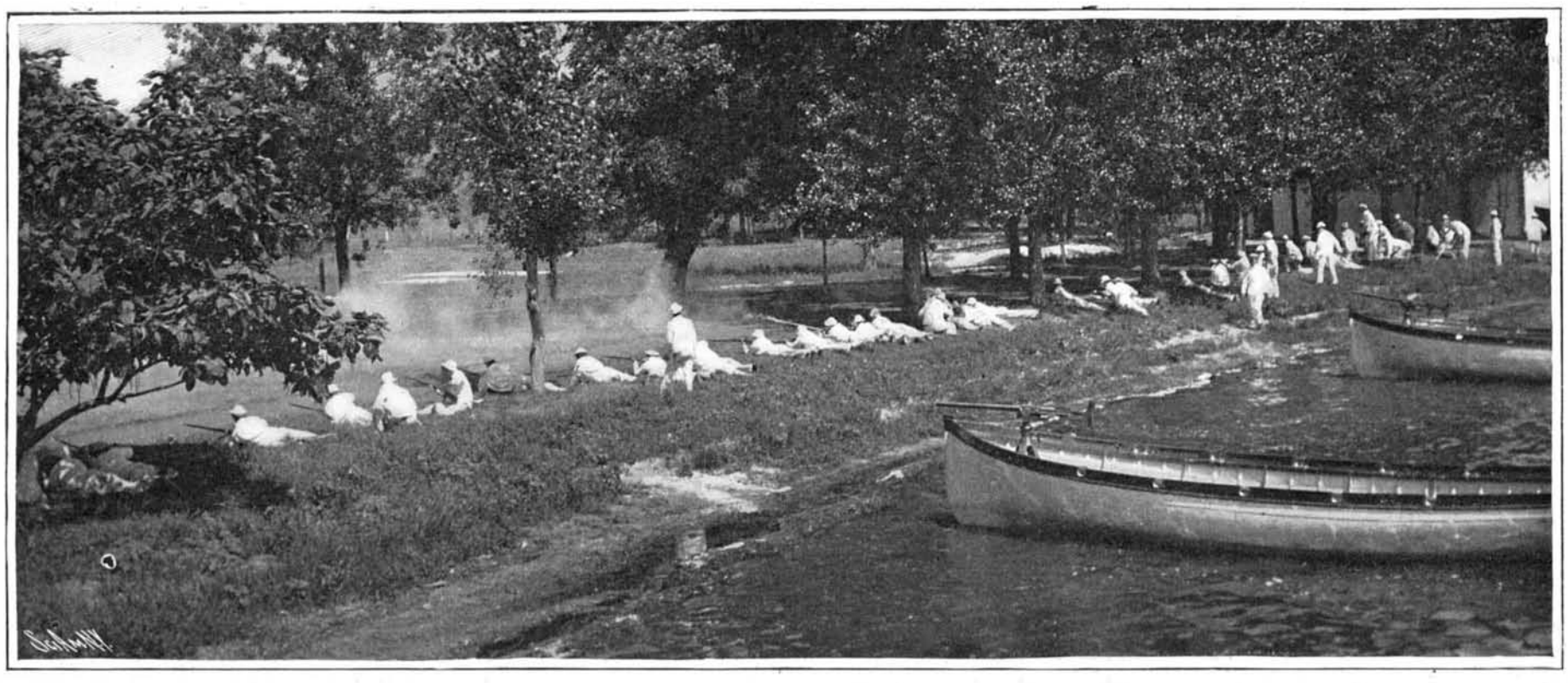
The cadets do not confine themselves to boating alone, but indulge in swimming, water polo, tilting matches, swimming races, baseball, tennis, and in fact all the outdoor sports dear to a boy's heart. The social feature is not neglected either, and the cadets are permitted to invite admiring femininity for pleasure sails in their cutters, and to a weekly dance or cotillon in the cadet gymnasium. In the forenoons there is some studying, but not enough to do more than make the rest of the day more attractive.

As for discipline, the cadets are required to observe the rules of naval courtesy and to walk and stand erect, to be prompt and precise. They are organized into a naval battalion of four sections, and form and march to meals, and each day at sunset they are drawn up in line for the firing of the evening gun and the lowering of the colors. Whenever a cadet desires to go beyond the limits for social or other reasons, he must have a pass signed by the commandant, but these passes are freely granted, the only condition being that they shall not be abused.

Last summer the cadets spent a week at St. Louis. The cutters were carried down on flat cars, and each day the cadets gave drills in the Grand Basin of the Exposition. This was the first time that naval craft had ever appeared among the launches and gondolas of an exposition lagoon, and during each afternoon drill thousands of spectators gathered to see them. At several of the drills distinguished visitors were tendered the honorary command of each cutter for a race between the crews. On one occasion, Gen. Edmund Rice, the President's representative at the Exposition, reviewed the cadets, and in the race that concluded the drill his cutter was first to cross the line, the gray-haired general taking almost as keen an interest in the outcome as did the excited youngster in the coxswain's box.



The Cutters Move into Line or Column and Change Direction in Response to Signals from the Instructor's Launch, Just as Ships of a Squadron would do on Signal from the Flagship.



Landing Drill. Skirmish on Shore. When Ammunition is Expended the Cadets Return to the Boats.

MANNING OARS AND HALYARDS AS A SUMMER OUTING.

Aluminium foil is used largely as a substitute for tin foil. One kilogramme—2.2040 pounds—of the metal is spun into 32 square meters of thin sheet. Some of the sheets adhere together, and this is worked into powder.

Particulars of Some of the Cars Built for the Gordon Bennett Cup Race.

Active preparations are now being made for the Gordon Bennett Cup race. The eliminating trials in France will be held over a circuit in the Auvergne region on the 16th of June, and 24 cars are to run. These consist of the Charron, Girardot, and Voigt; Panhard & Levassor; Gobron-Brillié; Richard-Brasier; Bayard-Clement; Darracq; Renault; Automoto; De Dietrich, and Hotchkiss. The prizes which are to be awarded to the winners in this event will be nearly $30,000. Most of the cars have been finished or are well under way, and we give herewith some of the leading features of several.

The three Panhard & Levassor cars somewhat resemble last year's type which were winners in the Ardennes Circuit and the Vanderbilt Cup. They have been modified to some extent and improved in the details. The motor has four cylinders of 170 millimeters (6.8 inches) diameter and stroke; it is said to give 120 horse-power at 1,200 R. P. M. Among the modifications we may note that the finned radiating coils have been replaced by a honeycomb radiator having a great cooling surface. An improved form of hydraulic regulator is used. The front of the car remains about the same, but the rear part has a pointed shape. The driving clutch is formed of friction plates, as this form has already proved successful. As in last year's car, the transmission from motor to rear axle is by a universally jointed propeller shaft. Magneto ignition is employed. The frame has been hung as low as possible so as to give the greatest steadiness in making the curves. The Panhard cars will be driven by Heath, Teste, and Henri Farman. The Richard-Brasier cars have also been considerably improved. The motor has four cylinders of 160 millimeters diameter and 140 stroke (6.4 by 5.6 inches) and gives from 90 to 100 horse-power at 1,200 R. P. M. A Simms-Bosch magneto supplies the ignition, with the new Brasier spark-break device. M. Brasier has also designed a new form of carbureter which is said to be much superior to the old. It uses a series of convergent jets. The governor of the motor acts upon the inlet valves, and the latter are mechanically operated. The chassis is lowered and has a relatively small wheel base, this being 2.65 meters (8 feet 10 inches), while the tread is 1.25 meters (4 feet 2 inches). The front and rear wheels are very nearly 3 feet in diameter. These cars are considerably under the regulation weight of 2,204 pounds. The construction is very solid and the exterior form somewhat resembles Théry's car of last year in which the reservoir is built around the driver's seat in the rear, thus obtaining a gain in weight. Théry, Callois, and Stead will drive these cars. But one racer has been entered by Charron, Girardot, and Voigt. It has an extra large four-cylinder motor, in which the cylinders are mounted separately. The inlet valves, which are mechanically operated, are symmetrical with the exhaust valves. All the working parts are protected by metal cases. The ignition is by Simms-Bosch magneto. The normal speed of the motor is 1,000 R. P. M., and at this speed the motor gives 90 horse-power. At 1,600 R. P. M. it gives 120 horse-power. The wheel base is relatively short, and this is well adapted for the many curves of the Auvergne circuit. A propeller shaft is used to transmit the power to the rear axle. The car has four speeds and a reverse. Girardot is to pilot this car. The Hotchkiss cars, three in number, are rated at 120 horse-power. The weight of the car is not much under the required limit. It is a little longer than last year's model, but about as wide. The wheels measure 34 inches front and 36.4 rear. This year the bonnet will not have a pointed form, but will be the standard Hotchkiss shape, namely, cylindrical, with a honeycomb radiator in front. A propeller shaft and bevel gear drive is used, and the speed changing device, which is very strong, has two sliding gear sets, and gives four speeds and reverse. A. Fournier, Le Blon, and Lavergne are the drivers.

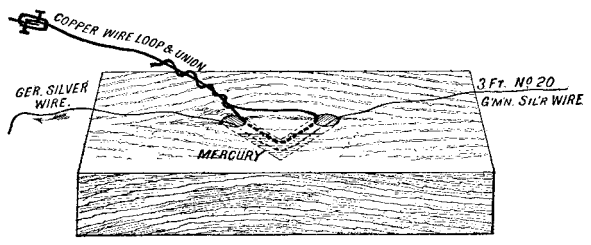
Among the English cars which will take part in the eliminating trials on the Isle of Man on the 30th of May, we may mention the Napier, which has a four-cylinder motor of 165 millimeters (6.6 inches) diameter and 150 stroke (6.0 inches). Running at 1,000 R. P. M., it gives about 120 horse-power. The upper parts of the cylinders are cast in pairs. To give a good distribution of the weight, the motor has been shifted back toward the rear to some extent. The radiator, of the honeycomb form, is now at the rear of the front axle. This arrangement is claimed to give less fatigue on the tires when making the curves. A turbine pump worked by chain from the motor assures the water circulation. The inlet is controlled by a handle placed on the steering wheel. The governor is centrifugal, and has an accelerating device which is worked by a pedal. Three speeds and reverse are used, with bevel gear drive. This car is of light weight, not over 2,000 pounds. It has a wheel base of 110 inches and a tread of 58 inches, with 35-inch front wheels and 34-inch rear. The Wolseley cars are distinguished by the use of a horizontal motor of four cylinders. Diameter and stroke are both 6.4 inches. At 1,000 R. P. M. it gives from 115 to 120 horse-power. The crankshaft is of nickel-steel. Chain transmission is another feature of the Wolseley car. It has four speeds and reverse. The wheel base is 9 feet and the tread 57 inches. The motor is placed somewhat farther in front than last year, so as to increase the adherence of the front wheels.

As to the German cars, two Mercedes have been already selected by the German Automobile Club, while the third is to be chosen in the eliminating trials which are to be held shortly. A circuit has been chosen to the north of Homburg for this purpose. The two Mercedes cars will be mounted by Jenatzy and Baron de Caters.

America will this year be represented in the great international race by one Locomobile and two Pope-Toledo cars of high power, which have been specially built for the event. The former machine is of 150 horse-power, and is constructed of nickel-steel practically throughout. It was designed by Mr. A. L. Riker, and built under his supervision for Dr. Harold E. Thomas, of Chicago, who has entered it in the Gordon Bennett race of July 5, and the Pike's Peak hill climb to take place in September.

A SIMPLE RHEOSTAT.

L. H. Batchelder, of Hamline University, St. Paul, Minn., thus describes the rheostat in the accompanying illustration: "I have long had in use in my laboratory a simple and inexpensive rheostat for maintaining a steady current of electricity. It is exceedingly convenient, for example, for maintaining a steady current in the quantitative analysis of copper or nickel salts; also in calibrating ammeters with the silver or copper voltameter. The materials required are a hardwood block about three by six inches and an inch thick, a bit of copper wire, a few drops of mercury and three or four feet of No. 20 or 25 German-silver wire. The wire must, of course, be kept bright



AN EFFECTIVE RHEOSTAT.

for good contact with the mercury. It is drawn to the left or right to be out or in the circuit as may be required to keep the current at a fixed value as shown by the ammeter in circuit."

A New Decision of the Automobile Club of France Regarding an International Race.

The controversy which has been going on for three months past relative to the Gordon Bennett cup and the different racing events has not by any means ceased. At its meeting of March 1 the Automobile Club of France made a new and important decision. This is to the effect that the committee of the club believes, in the present state of events, an annual racing event to be essential for bringing out the leading ideas and showing the progress of the industry. But, on the contrary, numerous events are ruinous for the constructors, without offering a renewed technical interest. If a single race is authorized outside of the Grand Prize, it is impossible to forbid others of the same kind. The multiple races, on account of their insufficient organization, will doubtless bring about catastrophes which will exasperate the populations and stir up public opinion against automobile events. The government will then be obliged to forbid the great annual race which is necessary for the prosperity of the industry which assures the existence of hundreds of thousands of workmen. The Automobile Club of France, upheld by the allied French and foreign clubs, by groups of the leading parties interested, and by the syndical chambers of industry, alone possesses sufficient quality and capacity for a good organization of a racing event. Owing to its influence such an event is sure to be a success, and bring great numbers of persons from other countries, to the benefit of the home industry. The safety of the public roads is a point which must be considered. Again, leading constructors express the desire to have but one race in France each year, this to be an open event, with no others. Accordingly the club declares that it is essential that the French government give its patronage exclusively to the great annual race of the club and send its delegates to this event; that it forbid all other races except the club's annual event; and that the promoters of other races abandon these projects and give their aid to the annual race organized by the club. The committee decides that in case its appeal is not favorably received, it will take the following measures, the importance of which is not to be overlooked: The constructors, organizers, chronometerers, proprietors, and conductors who take part in any other races except the annual event which the club organizes (for 1905 this will be the Gordon Bennett Cup race) will in the future be excluded from all events which are organized by the club or under its patronage. This measure is to be officially communicated to all the allied French and foreign clubs. The Automobile Club opens a subscription list for this year's event and heads the list with $5,000. The above decision does not apply to touring events. As a result of this decision, the Gordon Bennett Cup will be the only race organized by the club this year, and its rules will not be changed. Next year the cup race will perhaps be replaced by the Grand Prize, which will be an international and open event. The sum of $20,000 which had been offered by the Paris journal, the Auto, for the Grand Prize, will be devoted instead to the French eliminating trials.

Explosion of Gas Buoys.

A recent explosion of gas buoys is being made the subject of investigation by the Canadian government. At the time of the explosion, the buoys had been filled with gas at a pressure of 180 pounds to the square inch, and a third was being filled when one of the other two buoys exploded, the rupture taking place along a welded seam four feet in length. Flying metal penetrated the adjoining buoy, causing it also to explode. The accident is considered to be due to defective welding, and it serves to prove that the policy of the government, in its recent adoption of low-pressure acetylene gas buoys, is a wise one. These buoys carry a charge of acetylene in a central tube on a grating. When the buoy sinks to a certain depth, sufficient water enters automatically to generate gas from the carbide. The gas expels the water, and automatically cuts off the intake of water. As the gas is consumed the water again rises, touching the carbide and producing more gas. The pressure does not exceed about three pounds to the square inch, and some of these buoys used last season have given excellent satisfaction.

The Current Supplement.

The opening article of the current SUPPLEMENT, No. 1531, describes an economical coal-handling plant. A variable-speed gear giving all speeds from zero to maximum is illustrated and fully explained. Perhaps the most efficient device which has thus far been used in detecting the presence of radio-activity is the electroscope. One of the most valuable articles in the current SUPPLEMENT is that which describes the construction of an electroscope for experiments on radio-activity. Dr. O. N. Witt presents another article on the Chemistry of Patinas. Emile Guarini writes on a new thermo-electric battery. A new secret service telephone is the subject of an article by the English correspondent of the SCIENTIFIC AMERICAN. When completed, the Japanese battleship "Kashima," recently described in the columns of the SUPPLEMENT, will be the most powerful war vessel afloat. Trials of the armor plate with which the "Kashima" is to be protected were recently carried out at Manchester. An illustrated article in the SUPPLEMENT describes the results obtained. J. E. Gore presents a popular account of stellar brightness and density. Loewy and Puiseux have been for years engaged in making a photographic study of the moon. The Paris correspondent of the SCIENTIFIC AMERICAN reviews the results of their work. The third and last installment of A. J. Hipkins's article on Musical Instruments, Their Construction and Capabilities, is presented. He deals with keyboard instruments. An excellent paper by Sir William Lockyer is that on "Our Sun and Weather."

Submarine Mines for the German Navy.

Owing to the widespread success that has attended the employment of submarine mines during the Russo-Japanese war, the German naval authorities have decided to devote greater attention to the subject of sea mines than has been their practice hitherto. A mine company comprising two hundred men has been formed, and will be stationed at Cuxhaven, this naval port having been selected as a base from which the entire defensive operations of the North Sea will be directed. There are three mine-laying vessels at present in the German navy, but these are to be partially superseded by six torpedo-boats, which have been stationed at Cuxhaven for the use of the new mine company. It is anticipated that when the men have been trained to lay mines with quick-moving torpedo-boats, it will be practicable to block the estuary of the Elbe with stationary and floating mines within a space of twelve hours.

A conference of scientific scholars is being held at Colorado College, Colorado Springs. Leading universities and colleges are represented. A number of valuable papers upon subjects bearing on the scientific problems of the Rocky Mountain country will be read, and the results of the conference give promise of much permanent value. A similar conference held a year ago at this same institution was of such importance that it led to this second series of meetings.

Correspondence.

A Case of Rapid Development.

To the Editor of the SCIENTIFIC AMERICAN:

I was much interested in the article entitled "The Giantess Rosa Wedsted," in the SCIENTIFIC AMERICAN for April 15.

The article states that "by the time she had reached her fourteenth year, she had attained the *astonishing* height of 5 feet 7 inches."

Now, while I do not pretend to compete with this lady, I should like to say that on my fourteenth birthday, I measured 5 feet 6½ inches. And on my fifteenth I measured 5 feet 9 inches. If this is an *astonishing* height for one of my age, perhaps my case is worthy of notice. F. L. JOSLYN.

New Brunswick, N. J., April 21, 1905.

Sentiment Versus Sense.

To the Editor of the SCIENTIFIC AMERICAN:

When I visited Niagara Falls two or three years since, being fresh from the far grander spectacle of the incoming tide at Manhattan Beach, I should have felt myself poorly paid for my trip but for the inspiring study of the giant dynamos down the gorge. Here was something worth seeing indeed—the triumph of the human intellect! Not a great mass of dead matter tumbling in meaningless froth and noise, but matter impressed with mind and exerting its Titanic power with a grand and beneficent purpose. Success to the bold and intelligent projectors of all such schemes and avast with the sentimentalist who seeks to thwart them! Let them go and shed tears over the noble red man of the woods and the desecration of our noble, primeval forest with the sound of the woodsman's ax! However, I am consoled by the reflection that Bostonian æstheticism cannot affect the sturdy English sense on the other side. Niagara will be metamorphosed into something more significant than falling water in spite of dilettantism.

JOHN PRATT.

Seeing Stars in Daylight.

To the Editor of the SCIENTIFIC AMERICAN:

In the issue of April 1, Arthur K. Bartlett, in an article on "Astronomical Anomalies," doubts whether stars can be seen in daytime from the bottom of a deep shaft. In July, 1882, I was engaged in retimbering an old shaft, less than 200 feet deep, and about 6x10 feet in size, at Mineral Point, Col., at an altitude of about 12,000 feet. This shaft had no covering. The air was poor, and a candle would burn only dimly. We did considerable of the work with no other light than what came down the shaft. I distinctly remember that we could see stars almost any time in the day except near midday. We could also notice that we could not see the stars until after being down in the shaft for half an hour or so. I also remember that there was a particularly bright star that would pass over the shaft about 3 P. M. This shaft had a slight dip to the north of probably 10 deg. from the perpendicular. So, some astronomer might be able to figure out what star or planet it was.

I followed mining for over twenty years, and this was the only time I ever saw a star from a shaft, but these I remember very distinctly.

It is seldom that a mining shaft is so situated as to make observation possible, being usually covered with buildings or hoisting gear before any great depth is obtained. PARK B. BEATTY.

Halsey, Ore., April 15, 1905.

Seeing Stars in Daylight.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of April 1, 1905, appeared an article entitled "Astronomical Anomalies," and signed by Mr. Arthur K. Bartlett, in which he seems to doubt the possibility of viewing stars from the bottom of a deep well or shaft during daylight; and it appears as if he bases his opinions more on theory than actual practice. As he calls for verification of the disputed question, I herewith quote my own obhervations in that direction.

During my experience in the mines, where I was employed as an engineer, I have many times witnessed the sight of stars from the botttom of a shaft, some of these shafts being no deeper than 75 or 100 feet. The greater the depth, down to a certain point, the brighter the stars appear. After this point is passed, the mouth of the shaft becomes so small to the observer as to be almost invisible, thus shuttting off all view of the heavens.

I mention this, because there is a mistaken idea existing that one must necessarily be in the bottom of a shaft in order to properly view the stars. I have also noticed that stars may be seen in several places on the Colorado River, where the stream runs through deep and narrow cañons. The latter observation I first noticed at or about noon while eating lunch. Not being familiar with the names or positions of the stars, I am unable to name any that I ever saw, but those that lay within the scope of vision could be plainly seen. F. W. WILLIS.

Chatsworth Park, Cal.

That Stone Ball.

To the Editor of the SCIENTIFIC AMERICAN:

In the last edition of your valuable paper appears an article about the spontaneously-moving stone ball. My idea of the cause of this motion is not so much the sun, but the wind. If the socket which carries the ball is of such a shape as to support the ball in the center, and by a slight motion of the ball touches it with the outside edge, the wind which may cause a little trembling of the ball, will press the one side, opposite the direction from which the wind blows, and will try to roll the ball over this edge, but this being impossible, the slight turning away by the force of the wind will result in a minimum rolling of the ball at every strong push of the wind. As the several storms come from the north, the ball will turn toward the south. ADAM BRENZINGER.

New York, April 13, 1905.

The Moving Ball of Stone.

To the Editor of the SCIENTIFIC AMERICAN:

I note in the April 15 edition of the SCIENTIFIC AMERICAN an article in regard to a spontaneously-moving stone ball in the Marion, Ohio, cemetery. I am of the opinion that instead of the expansion and contraction of the ball, the expansion and contraction of the base on which it rests is the true cause of the phenomenon. In the daytime, when the sun is hot, the base expands. The ball therefore settles a little deeper into the socket, especially on the south side. Then as the base cools at night it would have a tendency to push the ball northward and upward because the expansion and contraction would be greater on the south side of base, hence causing the ball to rotate from north to south. As the sun does not strike the ball squarely on the under side, it would not have much effect upon it, as is the theory of State Geologist Edward Orton, Jr. J. W. BURGNER.

Veedersburg, Ind., April 16, 1905.

The Stone Ball.

To the Editor of the SCIENTIFIC AMERICAN:

I submit the following as an explanation of the rotation of the "Spontaneously-Moving Stone Ball," at Marion, Ohio, illustrated and described in your issue of April 15.

Beginning at sunrise, the side of the ball toward the sun is heated more highly than the opposite side. In consequence of this unequal heating and resulting expansion, the center of gravity of the ball advances toward the sun, and follows a curve during the day whose projection on a horizontal plane is somewhat elliptical in form. The center of gravity being thus removed to the south during the day, the effect is equivalent to adding a weight to the south side of the ball and thereby tends to effect the rotation observed. The slight jars and tremors occurring more or less constantly are sufficient to permit this constant stress to overcome the friction between the ball and its cup-like seat, and produce rotation.

The orientation mentioned below the illustration may be explained by unequal friction, as suggested by Prof. Gilbert. W. H. HOWARD.

Washington, D. C., April 17, 1905.

Another View of the Stone Ball.

To the Editor of the SCIENTIFIC AMERICAN:

In a discussion of the case of the "spontaneously-revolving stone sphere" at Marion, Ohio, reported in yesterday's issue of the SCIENTIFIC AMERICAN, W. H. Rayner, of Springfield, Ohio, a brother of the writer, suggested a cause that might be profitably considered in an attempt to satisfactorily explain the strange phenomenon.

In brief, the proposition offered is that a film of water collects under the sphere in the hollow where it rests on the pedestal, filling the spaces arising from imperfect fitting of the sphere to the surface of its resting place. In freezing this water congeals at the top exposure first and seals the remainder, which, when it solidifies, raises the sphere vertically by virtue of the well-known expansion of water in changing into ice. Now, when this film of ice *thaws*, it softens on the *south side first*, causing or permitting the sphere to tilt or roll in that direction a certain amount, using a point slightly north of the center of contact as a fulcrum. When the remaining ice thaws, the sphere tilts or rolls toward the north, using the previously-established point of contact as a fulcrum. It is apparent the rotative effect of the last movement will be less than the previous one toward the south, leaving the net result an increment of rotation from north to south. E. B. RAYNER.

Piqua, Ohio, April 16, 1905.

[The most effectual answer to this view is to be found in the fact that the ball moves in summer as well as in winter. The expansion of freezing water cannot therefore be advanced as an explanation.—ED.]

Grandfather's Clock.

To the Editor of the SCIENTIFIC AMERICAN:

I have read the articles "Grandfather's Barometer" and "Some Weather Indications" published in your issues of March 4 and April 1, respectively. I have given the subject of meteorology some consideration, and as my instrumental equipment was rather crude, I found it advantageous to accustom myself as far as possible to the natural weather indications. My most satisfactory storm indicator has always been an observation made at noon, upon some object, such as a small white cottage, located at a considerable distance to the north of me. At first this little cottage will present no great changes, but when one becomes accustomed to noting its appearance from time to time, it will become apparent that just before a storm the object of our scrutiny will appear fresh and well defined, whereas in generally fair weather, its appearance will be more somber. (Or one might say the intervening distance seems shorter before a storm.) In paragraph 5 of "Grandfather's Barometer," notice is taken of lights viewed at night from a distance, seen brighter before a storm. This seems to be along the same lines.

The possible explanation of this phenomenon is that as the atmospheric pressure is less during stormy weather than in fair, and hence less dense, its transparency is increased, allowing the object to be more distinctly seen. EDWARD F. CHANDLER.

Brooklyn, N. Y., April 11, 1905.

Engineering Notes.

The freezing system is to be adopted in the construction of the new tube railroad for Paris at the point where the track will pass beneath the Orleans trunk railroad. For various reasons the ordinary shield process will not be suitable. The earth is to be frozen to a temperature of 30 degrees below zero, so that the excavators may be able to cut the tunnel without incurring any danger of collapse before the metal lining has been placed in position. The workmen, however, will experience some inconvenience while working at such a low temperature, but the engineers are of opinion that this method offers the only solution of the problem, and that it will be carried out successfully.

The construction of the new yacht for King Edward VII., designs for which were invited from private firms, is to be undertaken by the well-known yacht builders, Messrs. A. & J. Inglis, of Glasgow. This new vessel is primarily intended for short cruises and entrance to harbors of comparatively shallow draft. The yacht will measure 285 feet in length by 40 feet beam, and be of 2,000 tons. A noticeable feature of the vessel is that it is to be propelled by Parsons marine turbines, which will be arranged in the orthodox manner, with one high-pressure turbine in the center, and a low-pressure turbine on either side. A cruising speed of 17 knots is anticipated, with an astern speed of 13 knots. Steam is to be raised in a battery of cylindrical boilers.

A great irrigation project involving an expenditure of about $25,000,000 has been authorized by the Secretary of State for India. The area commanded by the canals is about 6,250 square miles, although only a small part of it will be reached for a number of years to come. In this area it is estimated that about 3,000 square miles will be irrigated. The water will be taken from the Jhelum River, in which there is now unappropriated at the site of the headworks a flow of 5,600 to 7,900 cubic feet per second. It is believed that the investment of public funds in these works, great as the sum may be, is well warranted by the economic advantages of the undertaking and the reasonable assurance of ample interest payments.—Engineering Record.

Several improvements have been effected in the system of constructing the underground tube railroad with the ordinary shield, in connection with the London tubular railroad from West Kensington to Brompton Road. Improvements have been made with the cutting shield, and the system of driving it into the clay by the hydraulic rams. Instead of removing the clay by manual labor, which has hitherto been adopted, an electric cutter is now employed, with the result that excavation can be carried out much more rapidly and more economically. The cutter excavates the earth, which falls on an automatic conveyor, and this in turn dumps it into skips, which are drawn to the base of the shaft by ponies, and the ballast is conveyed to the surface by hydraulic lifts. This new shield excavates at double the speed of the former appliance, and necessitates only half the number of workmen. The segments of iron rings forming the lining of the tunnel, each representing a weight of six hundredweight, are also lifted and placed in position for riveting by an hydraulic erecter.

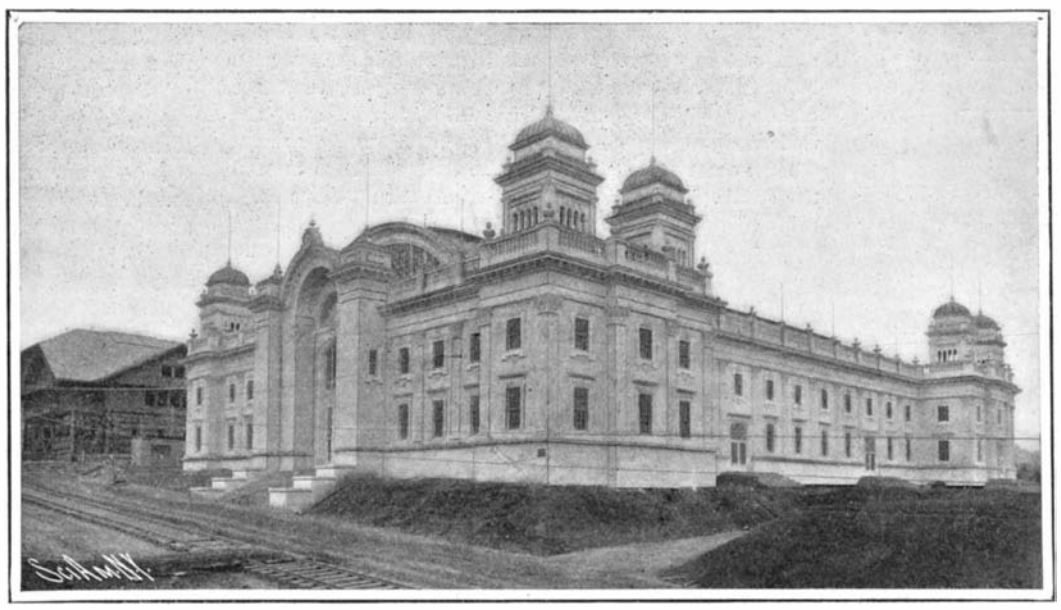
THE LEWIS AND CLARK EXPOSITION.

BY DAY ALLEN WILLEY.

The exposition to be opened in the city of Portland, Oregon, in June next is of notable interest for several reasons. It is the first of the kind yet to be held west of the Rocky Mountains, and is of such extent that it will give eastern people an intelligent idea, not only of the resources of the Pacific Northwest, but of its magnitude, and the remarkable development which this part of the United States has already attained. It also commemorates the acquisition of the only territory ever annexed to the United States by the right of discovery. It may be said, however, that all of the Pacific Northwest, as well as the portion explored by Lewis and Clark, participates in the celebration, for not only Oregon, Washington, and Idaho—the "Oregon country"—but Montana, Wyoming, and California, are represented in the display. Excluding California, this territory covers nearly 500,000 square miles of America.

Lewis and Clark started up the Missouri River with their little band of explorers in May, 1804, reaching the mouth of what is known as the Lewis and Clark River in November, 1805. It was originally intended to have the exposition on the site of old Fort Clatsop, which may be called the western terminus of the expedition, but such an excellent site was afforded in the suburbs of Portland, on the banks of the Willamette River, that here 430 acres have been laid out for the purpose, making an ideal site, since it has natural advantages, which add greatly to the picturesqueness of the buildings and other artificial adornment. The foothills of the Cascade range furnish a rolling topography, which gives an opportunity for the construction of terraces and other ornamental features, and has allowed the principal buildings to be placed upon eminences, which give them an imposing appearance. In the vicinity of Portland are some of the noted peaks of the Cascades—Rainier, rising to a height of nearly 15,000 feet; Mount St. Helens, nearly 10,000 feet in height; while Mount Adams and Mount Hood are also in view of the site. Rainier is one of the most remarkable peaks in the world, being so extensive that it forms a miniature range of mountains in itself. Almost at the edge of the exposition grounds are portions of the primeval forest, and one of the most attractive features of the exposition is a park which has been laid out through the woodland. Another feature worthy of note, however, is the marine vista, provided by what is called Guild's Lake, which is included in the grounds—a sheet of water covering 200 acres. Yet the exposition, as stated, is in a suburb of Portland, and readily accessible to the visitor.

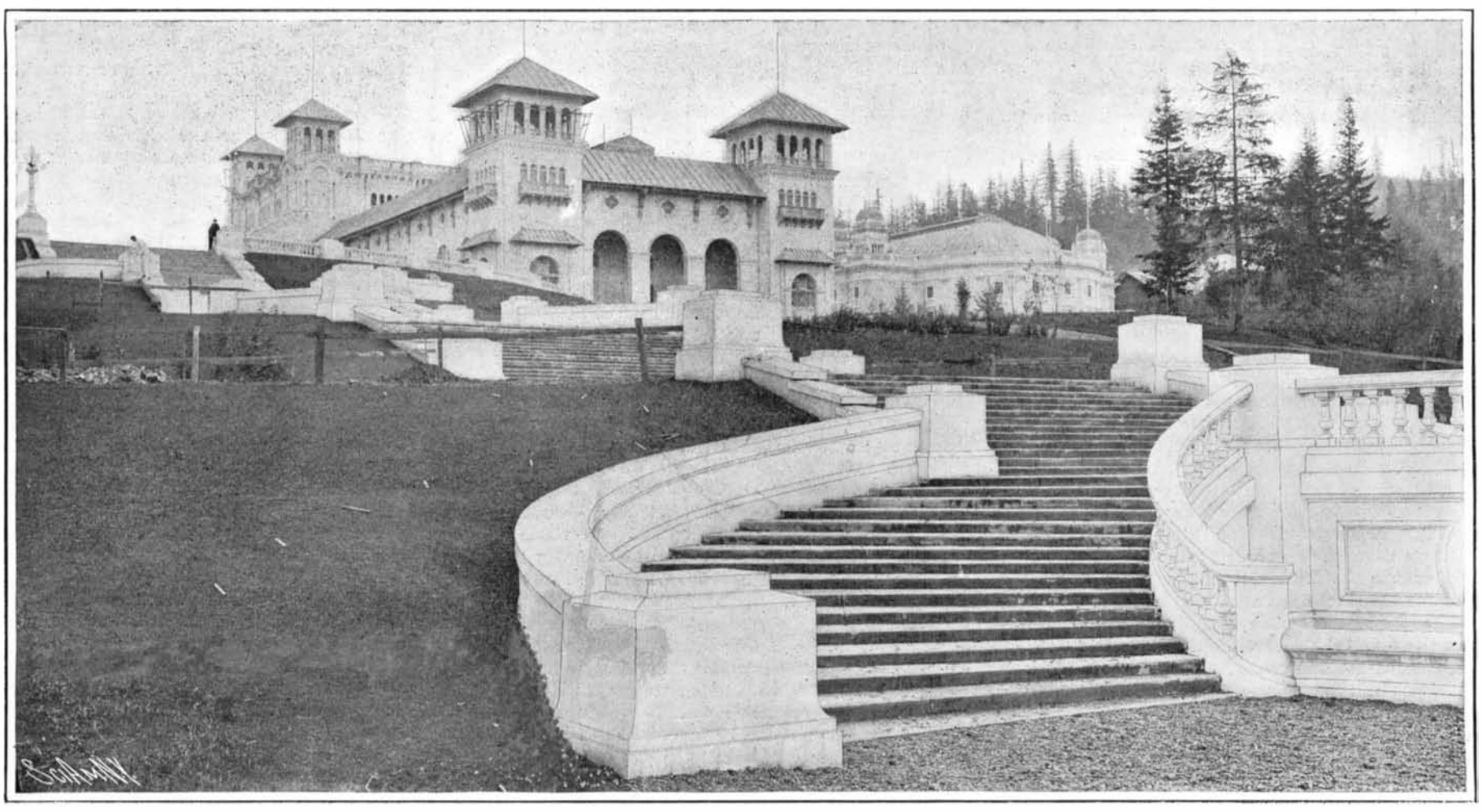
Naturally, the number and dimensions of the buildings will be compared with the structures at St. Louis; but while they are considerably smaller, the group of main edifices are of such design that they make a very creditable showing, and are of a capacity adequate for the purpose intended. The largest of the group, which is devoted to agriculture, is 460 feet in length and 210 feet in width. It is rendered conspicuous by the large dome, surmounting it, which is covered with green translucent fiber. This building contains several pavilions intended for more elaborate displays of product of field, orchard, and garden, and the interior is ornamented by pilasters and statuary placed in niches about the walls. The structure devoted to European exhibits is 462 feet in length by 100 feet in width, and as its title indicates, will contain displays made by European manufacturers and tradesmen—displays which represent all of the important countries of the Continent, as well as Great Britain. The same may be said of the Oriental exhibits, in which China and other portions of the Asiatic mainland are represented, as well as Japan and some of the larger islands of the Pacific. The progress made by the Pacific Northwest in mechanical devices will be shown in the building devoted to machinery, transportation, and electricity—a structure 500 feet long; while that housing the liberal arts and varied industries is 375 feet by 240 feet in dimensions, and one of the most attractive on the grounds. It has been wisely determined to make the fine arts building a permanent structure; and while the others mentioned are erected with wooden framework covered with staff, this will be composed of brick and concrete. The extent already attained by the mineral industry in the Northwest will be illustrated in the building devoted to mines and metallurgy. The ore deposits and variety of minerals will be demonstrated in collections secured from the principal districts. In view of the importance of this resource, an opportunity is afforded to make it one of the most significant and instructive features of the exposition.



The Palace of Oriental Exhibits.

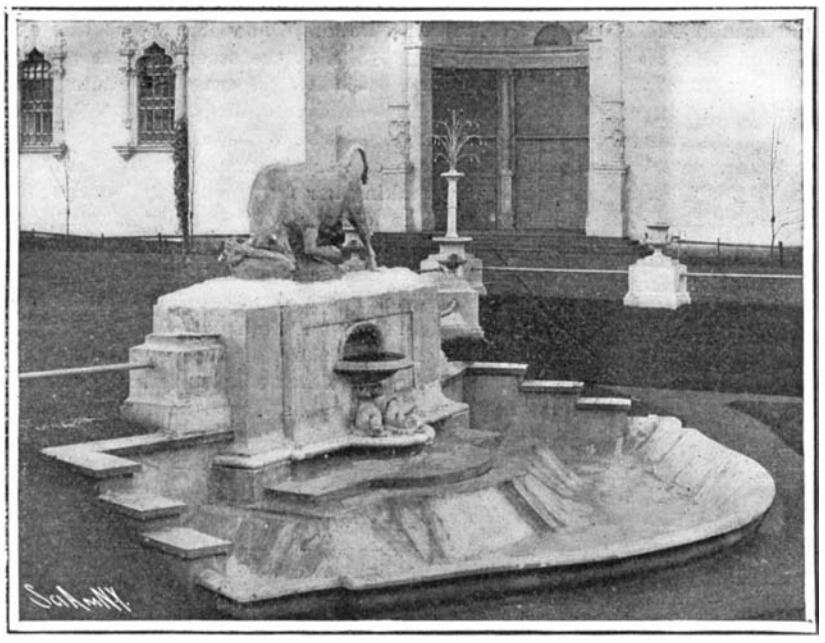
The most interesting of the group from a technical standpoint is the forestry building. This is really a gigantic log house—the largest of the kind ever erected. It exemplifies in its composition the forest wealth of Oregon and Washington. Besides being a timber exhibit itself, it will contain all the finished products of the forest as well as the woods in their native state. In its construction two miles of fir logs, five and six feet in diameter, eight miles of poles, and tons of "shakes" and cedar shingles were used. The logs have been left in the rough with the bark on. The base logs of the building are 6 feet in diameter and 52 feet long. The logs above the base are 3 feet through and vary in length. Colonnades of fir trees 30 feet high and 6 feet in diameter support loggias or galleries over the main entrances. Picturesque balconies are at each end of the building. The portico over one entrance is supported by giant spruce trees, and the other shows a colonnade of large hemlocks. The upper part of the building is sheathed with cedar bark shingles laid 18 inches to the weather. An overhanging roof adds much to the attractiveness of the structure. In the interior of the building as well as the exterior a colonnade of fifty-two columns of fir and cedar trees 40 feet high supports the roof. Rustic stairways and inside balconies running around the entire building enable the visitor to study the virgin display of native woods and other products of the forest. In the construction of the forestry building no carpentry work was employed, the logs being framed together with treenails and wooden pins. The trees used were cut in the forest bordering on the Columbia River. They were formed into rafts and floated down the Columbia and Willamette rivers into Guild's Lake. From the lake they were raised to the site of the building in Centennial Park by means of a skidway 1,500 feet long.

Fortunately, the government will be most creditably represented, an appropriation of $475,000 being made for the purpose. The buildings housing its displays are five in all, the main structure being connected with the smaller ones by ornate peristyles. The front of



The Ornamental Approach to the Plaza of Exhibits.

THE LEWIS AND CLARK EXPOSITION.



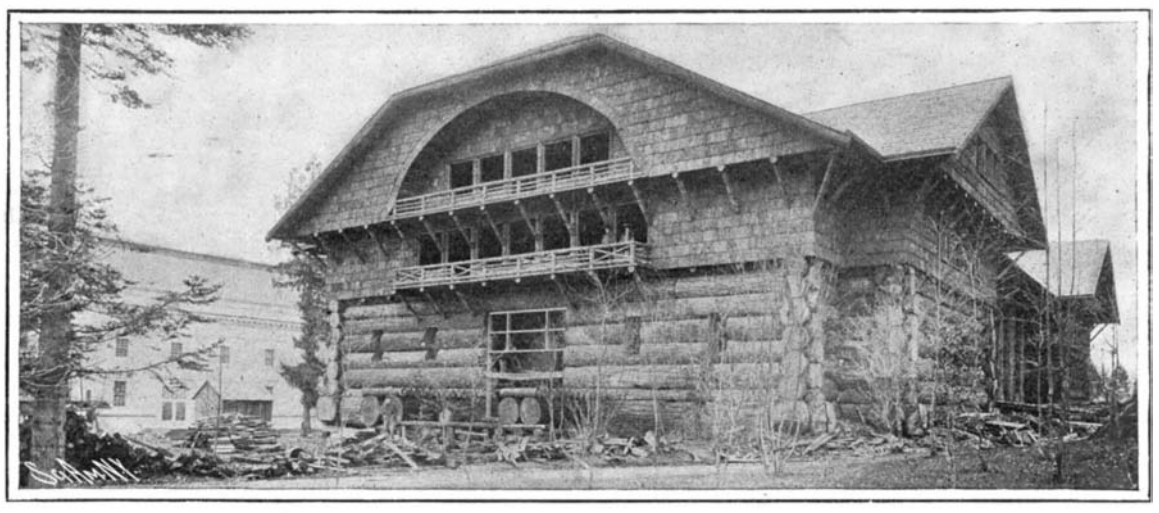
Group in Columbia Court. Bull Fighting Lynx.

Remington's "Hitting the Trail."

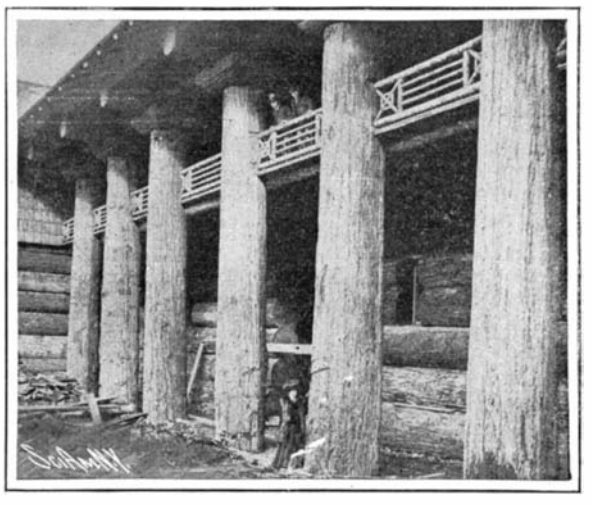
Statue of Capt. Meriwether Lewis.

"Cowboy at Rest." Centennial Park.

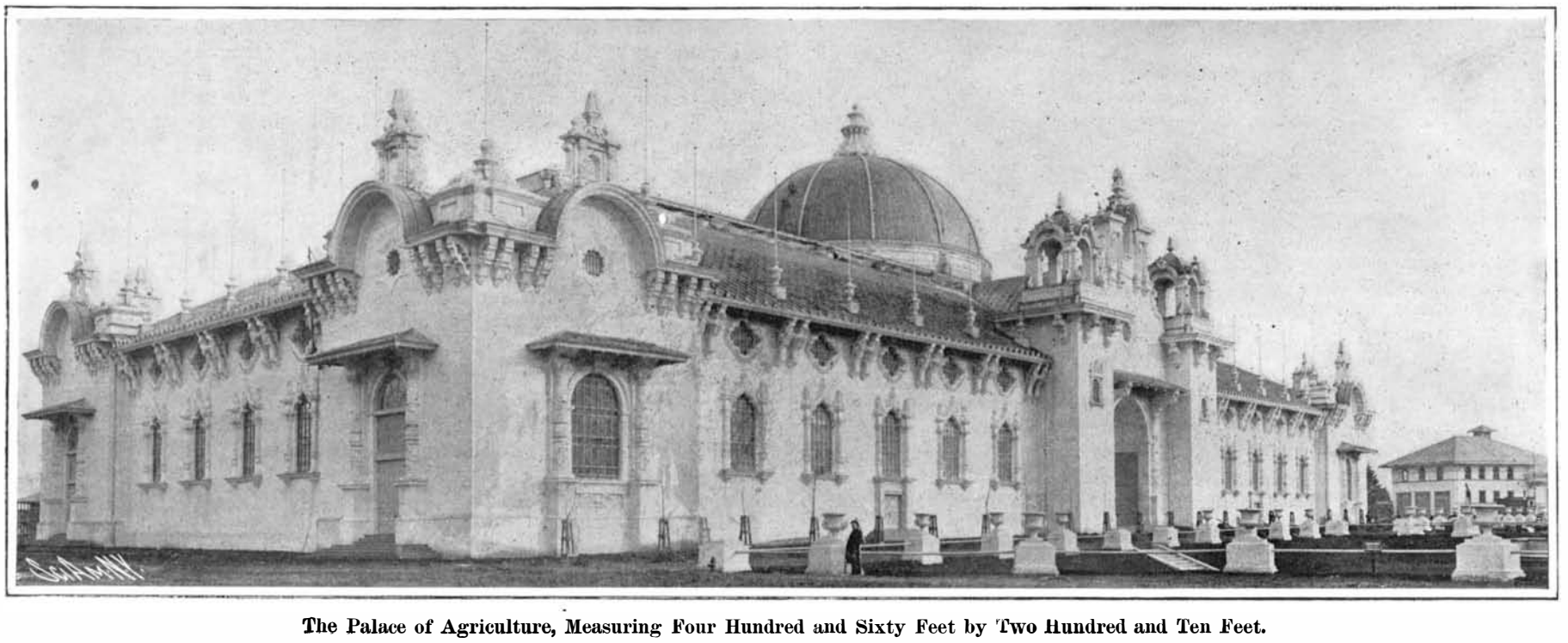
Statue of Capt. William Clark.



The Forestry Building. A House of Gigantic Logs.



Entrance to Forestry Building.



The Palace of Agriculture, Measuring Four Hundred and Sixty Feet by Two Hundred and Ten Feet.

THE LEWIS AND CLARK EXPOSITION.

the main building is spanned by five arches, each 40 feet wide, supported by Corinthian columns 44 feet high. The building has two towers, each of which is 260 feet high, and is surmounted by a dome. The roof of the main building is arched, the highest point being 130 feet from the ground, while at each end is a half dome. Constructed in the Spanish Renaissance style of architecture, in harmony with the others, the building is from an architectural standpoint one of the finest on the grounds. It is situated some little distance from the lake, which it faces, and being directly opposite Columbia Court, the main plaza of the exposition, the view of the main exposition picture obtained from it is very attractive.

The territorial pavilion is located to the west of the main building, and the irrigation building to the east, the fisheries building being behind the latter. The minor buildings are in the same style as the main structure, but with less ornamentation. The government displays will include progress in irrigation, fish culture, collections from the War and Navy departments, as well as mechanical appliances, in addition to documents and relics from the State Department, also a miniature Filipino village populated by natives of the islands. In fact, the government display will be nearly as elaborate as that which it made at St. Louis.

The plan of the exposition embraces nine exhibit palaces excluding the government group, but in addition are the festival hall, the gathering place for conventions and other meetings, and the administration building, containing the main offices of the exposition. The principal amusement feature will consist of what is called the "Trail," where duplicates of many of the "shows" seen at St. Louis and Chicago will be located.

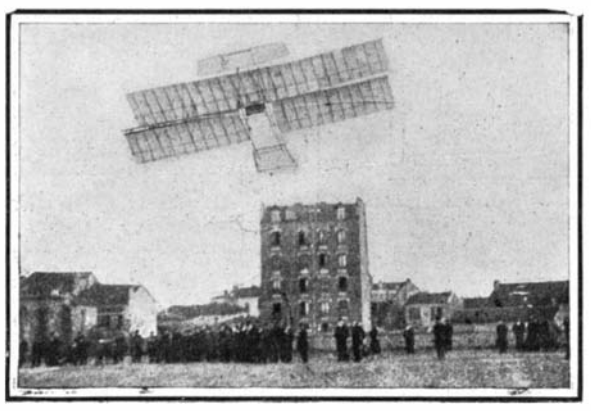
Such is the interest manifested in the Lewis and Clark Centennial, that over $4,000,000 have been expended upon the exposition by the people of the Pacific Northwest. The city of Portland alone has given nearly $450,000, although its population is less than 150,000. The country in the vicinity, however, forms another exposition of how rapidly commerce and industry have progressed in this part of the United States. It will probably be almost as interesting to visitors unacquainted with this part of the world, as the display which has been described. The scope of the undertaking can be appreciated, when it is stated that besides Oregon, Washington, Montana, Idaho, Wyoming, and California have made a liberal appropriation, and the people of British Columbia as well have manifested a deep interest. The projectors have secured the cooperation of Eastern States to such an extent that New York, New Jersey, and Massachusetts have erected structures. These, with the government share in the display, have assisted in making it to a certain extent national in its character.

Another Mont Blanc Railway.

According to a recent issue of the Schweizerische Elektrotechnische Zeitschrift, another scheme has been presented for a Mont Blanc railway, the starting point being Flayet station of the Paris-Lyons-Marseilles Railway, which lies 580 meters above the level of the sea in the neighborhood of Saint Gervais. From Rogues (2,645 meters) the track is endangered by avalanches, against which special protective constructions have been provided. The railway will thence lead up Tête-Rousse (3,165 meters) and finally up to Aiguille du Goutor (3,825 meters) at 950 meters below the summit of Mont Blanc. Its length up to this point is 18.5 kilometers. For the remaining section up to the summit of the mountain, a small special railway is to be constructed, which however is to be replaced at the outset by comfortable footpaths and sled-roads. The rack railway up Mont Blanc is to be operated by electricity, its gage being 1 meter, thus cutting down the radius of curves to 60 meters. Any gradients exceeding 25 per cent are to be avoided. A speed of 7 to 8 kilometers per hour has been provided for, any higher speeds being precluded by the impracticability of exposing the passengers to an abrupt change in atmospheric pressure. Ten trains are to be run each day, both uphill and downhill. The cost of constructing the railway has been estimated at 10,000,000 francs ($2,000,000) working out at about 540,000 francs ($108,000) per kilometer. The fare of a return journey will be 40 francs ($8). It is thought that out of the 90,000 travelers passing through Chamonix each year, but refraining from a Mont Blanc ascension, which, apart from the fatigue it involves, requires nearly three days and costs a minimum of 300 francs ($60), about 25,000 will thus be induced to undertake a one-day journey up Mont Blanc.

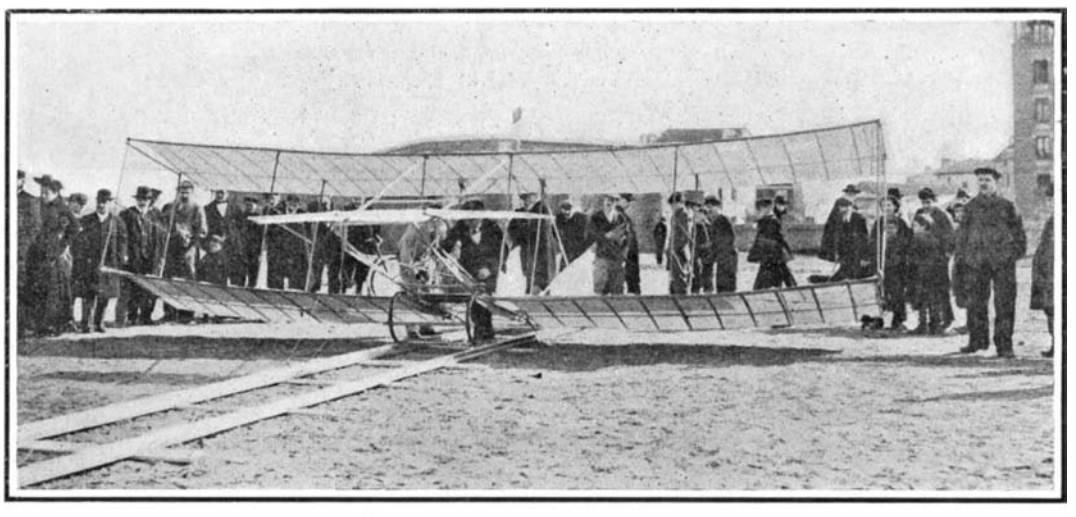
RAISING AN AEROPLANE WITH AN AUTOMOBILE.

M. Ernest Archdeacon, a Frenchman who has been experimenting with aeroplanes, recently conducted some experiments in raising an aeroplane by means of a powerful 60-horse-power automobile. The aeroplane was mounted on runners adapted to slide upon a greased wooden track some 60 feet in length, and it was loaded with a weight equivalent to that of a man. A rope 75 feet long was run from the aeroplane to the automobile, and when the latter was started, the aeroplane rose gracefully to a height of about 100 feet, in three or four seconds, after which the rope was cut, and the aeroplane, on account of the breaking of one of the planes of its rudder, described several arcs in space and suddenly fell, breaking itself in pieces, as shown in one of our illustrations. The aeroplane was of the type employed by the Wright brothers in this country; that is, with a guiding aeroplane placed in front. It remained stable in the air for a few seconds until the rudder broke. The experiment was interesting, although the aeroplane was not controlled.



The Archdeacon Aeroplane in the Air.

All That Was Left After the Flight.



Launch of the Aeroplane.

TRIALS OF THE ARCHDEACON AEROPLANE.

The French government has intrusted the planning of a new railroad from Chamonix to Aosta. This undertaking involves the boring of a tunnel through Mont Blanc, but M. Jacquier does not consider that this task would prove so difficult as the Simplon tunnel. The Mont Blanc tunnel will be 8½ miles in length. It will commence at Chamonix, 3,415 feet above sea-level, and end at Entreves (4,550 feet). The Dora Baltea would give ample water for the boring work, and afterward for locomotion. The engineer states that the rock of the mountain gives no indication of subterranean reservoirs.

The Largest American-built Steamship.

The steamship "Dakota," now loading at this port for her maiden voyage, is the second of the gigantic vessels constructed by the Eastern Shipbuilding Company, of New London, Conn., for the Great Northern Steamship Company. She is in practically every respect a duplicate of her sister ship the "Minnesota," which is now making her first homeward voyage from the Orient. The dimensions of the "Dakota" are: Length over all, 630 feet; extreme beam, 72½ feet; and depth from upper navigating bridge to bottom of the keel, 88 feet 4 inches, which is equal to the height of an ordinary eight-story building. When fully laden, the displacement of the "Dakota" is 33,000 tons, and with her full cargo (and she has a gross tonnage of 20,718 tons) she can make 15 knots even in heavy seas. In order to carry such an enormous cargo at the speed mentioned, and in all kinds of weather, the "Dakota" is built to withstand extraordinary strains, some of her double plates being as much as 2½ inches in thickness. The stem and stern posts are of cast steel and of the greatest weight ever used in naval construction, the stern post alone weighing 55 tons. The total accommodations are for about three hundred first-cabin passengers, while below deck provision is made for carrying thirteen hundred troops or twenty-four hundred third-cabin passengers.

The ship is driven by twin-screw triple-expansion engines of about 10,000 horse-power furnished with steam at 250 pounds pressure by water-tube boilers of the Niclausse type. Each engine is located in a separate water-tight compartment, and the boilers are also divided into two similar compartments, accessible one to the other through small water-tight doors. Thus in case one engine room should be flooded, the other engine could drive the ship on her journey. A distinctly novel feature in these ships is that some of the boilers are fitted with mechanical stokers—an improvement which will, we believe, in time become general in the merchant marine.

A powerful windlass is placed at the bow for raising the anchors, each of 8½ tons, and the anchor chain, which weighs over 80 tons, is the heaviest ever built. The full equipment of life-saving appliances as prescribed by the United States government is carried on board, and for putting out flames a patent fire-extinguishing system is installed, by means of which any compartment of the ship may be immediately filled with a gas in which a fire cannot possibly burn. For handling the cargo in and out of the numerous hatches no less than thirty-two electric winches are placed on the deck.

A Reinforced Concrete Warehouse.

A brick and reinforced concrete warehouse has been built in Toronto, Ont., for Brown Brothers at practically the same figure as for slow-burning mill construction. The building is 192 feet by 42 feet in plan, with stories 10 feet, 15 feet, 14 feet 6 inches, 13 feet 6 inches, and 13 feet 6 inches high from basement up. The floors are designed to carry 300 pounds per square foot, and the columns are on 16-foot by 12-foot centers. The columns are reinforced by steel rods at the corners, with a wrapping of expanded metal like the hoops of other systems of construction. The columns are connected by concrete girders reinforced with six rods near their bottom surface, some of these rods being bent upward at the ends. Instead of stirrups or loops, the girders have sheets of expanded metal at their ends. The floor-beams are of similar construction, but smaller.—Building News.

Marconi and De Forrest in Court.

In the United States Circuit Court for southern New York, Judge Townsend recently handed down a decision which involved the validity of certain of the claims of Marconi's broadened and reissued patent of 1901. Only six of the fifty-six claims of that document were involved in the litigation, and the complaint was dismissed in respect of four of these. The two claims which are upheld affect the use of aerials or antennæ. The upholding of these claims affects vitally the maintenance and operation of every wireless telegraph station which is used for long-distance transmission of signals.

FINDING OF THE BODY OF ADMIRAL PAUL JONES IN PARIS.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The news that the body of Admiral Paul Jones had been discovered in Paris naturally awakened a considerable sensation. The body was found in fact in one of the ancient cemeteries of the city, and was then removed to the Medical College, where an autopsy was made. Gen. Horace Porter, the United States ambassador, and Col. Bailly-Blanchard, second secretary of the embassy, had been making researches to this end for some time past. It was known that the body had been buried in Paris in one of the old cemeteries, and for more than six years Gen. Porter was occupied in making different excavations, in the hope of recovering the body of the renowned admiral, the "Father of the American Navy," who died, it will be remembered, in 1792. At last his perseverance was rewarded, and the body came to light in a better state of preservation than could be hoped for. The discovery is naturally one which will awaken great interest in America, and it is proposed to transport the remains to Washington as soon as the plans are fully decided upon. It was in the old St. Louis Cemetery, where Protestants of foreign birth were buried, that success finally awaited the excavators after so long a time. The cemetery lies near the St. Louis Hospital in the Rue Grange aux Belles, in the northeast quarter of the city. The excavations in the cemetery were commenced by Gen. Porter about the first of February last. Some difficulty was experienced, as it was not known just where the body might be found, and so considerable excavating had to be done in the premises. Several lead coffins were brought to light, but each time the explorers were disappointed, as they all had plates with inscriptions. One of the latter mentioned simply "Anglois" (Englishman) with the date, on a copper plate. However, the fourth time proved to be successful, and the coffin by its exterior signs seemed to contain the remains of some eminent person, as it was of better quality than the others and of more solid build. It appears likely that a body had been buried above it, and some vestiges of this grave were found at the same time. It is supposed that when the upper grave was dug, they came upon the plate which no doubt had covered the lower coffin, and removed it, as no plate was found, and it was also noticed that the lower coffin had been pierced as if it had received a blow with a pick. The lead coffin was no doubt inclosed in a wood casket, and a few traces of the latter were found. The lead case is in the form of the mummy coffins which were used at that time.

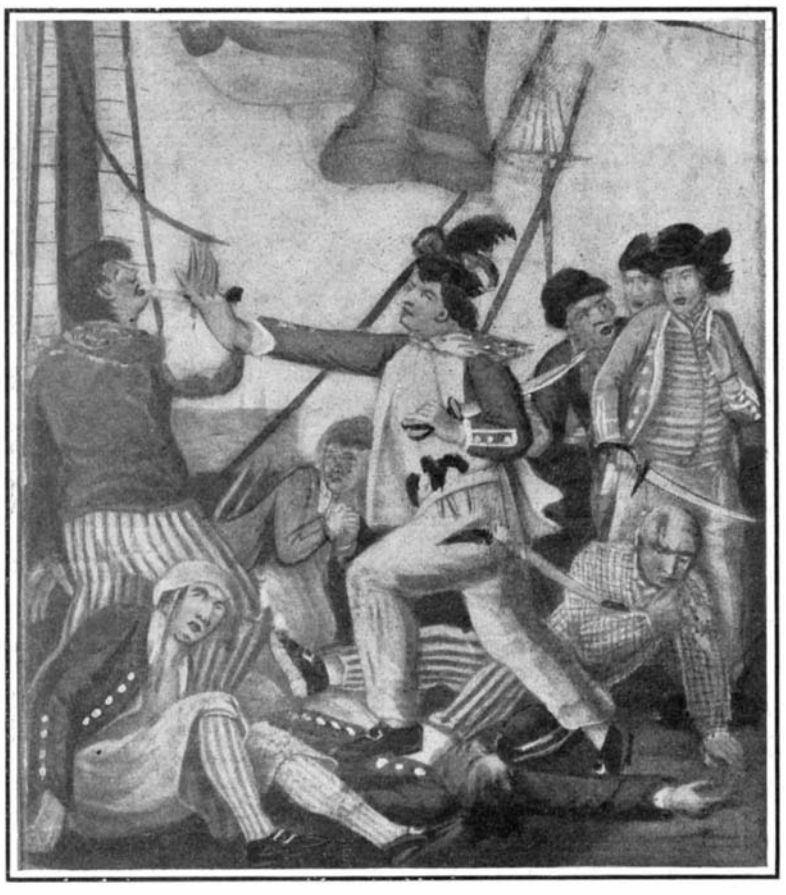
Upon removal to the Ecole de Médécine, it was opened in the presence of the representatives of the American embassy and some of the city officials. The body was found to be in a good state of preservation, and had been well packed so as to avoid movement, by means of hay and straw placed in the spaces. The limbs were covered with tinfoil. It is supposed that the good preservation is due to an immersion in alcohol. The body was dressed in a shirt and wrapped in a sheet. The shirt was found to be marked with a small embroidered initial, which might be taken either for a P or a J, according to the way in which it is read. There was no other clothing, nor were any other objects found, but this is not surprising, as we already know that the uniform, sword, and decorations of the admiral had been preserved by his family. Dr. Papillault, the distinguished anthropologist, and Dr. Capitan, another high medical authority, were chosen to examine the body. They made a certain number of measurements, and to give greater surety, the latter were taken before any other information as to the admiral's characteristics had been furnished. Such documents were not wanting, however, and Gen. Porter brought all the busts and portraits he could secure, so as to make the comparison. The examination was quite convincing, leaving no possible doubt as to the identity of the body.

The preservation is remarkable, and it was even found that the flesh is soft and yielding, so that the head and members could be moved without any difficulty. The face as it appeared is clean shaven and is of a dark color. The hair is abundant and quite long, according to the fashion of the time. The principal documents of comparison were two busts of the admiral, both by the eminent French sculptor Houdon. One of these was loaned by Marquis de Biron, of Paris, and the other came from the Trocadero Museum and is a copy of the bust now possessed by the Pennsylvania Academy of Fine Arts. The former bust represents the admiral in a court costume, with his hair arranged in the mode of the period, with masses at the sides of the head. The Trocadero bust is more lifelike, and shows him in his military costume, with the hair drawn back from the forehead. Besides, we possess different documents relating to the color of the hair, different dimensions of the body, etc. In this way, after a careful examination, it became evident that the person could be no other than the admiral. The height, upon measuring, was found to be exactly the same, or 5 feet 7 inches. The hair, which is of a dark brown, is of the same color as that which he was known to possess, and is slightly gray in some places. Examination of the head shows that it resembles the original documents as closely as possible

CASKET CONTAINING THE BODY OF PAUL JONES.

and in all the details. Especially noteworthy is the high forehead. The hair is quite long and flowing, with slight curls at the sides of the head.

The coffin is narrow at the feet, and gradually widens at the upper part to contain the shoulders, then finishes in a rounded part at the top for the head. The lead is quite thick, thus enabling the body to be well kept, and it was no doubt tightly sealed from the air until the hole had been made in it with the pick, as is supposed. It seems as if the wrapping of the limbs in tinfoil was done in order to prepare the body for a long transportation by sea. In fact, we have a letter of Col. Blackden, an intimate friend of Paul Jones and one of his pall-bearers, which reads as follows: "His body was put in a leaden coffin on the 20th that, in case the United States, which he had so essentially served and with so much honor, should claim his remains, they might be more easily removed." One of the interesting points about the discovery is that an autopsy could be made, owing to the fact that the organs of the body were so well preserved. The autopsy was carried out at the Ecole de Médécine by Drs. Papillault and Capitan, and they were struck with the good state of the remains. It was not difficult to find that the admiral had died of tuberculosis, and this is known to be the case. After the autopsy the remains were put back in their original position. A second lead coffin was constructed, so as to surround the first, leaving a large oval opening at the top covered by plate glass, so that the head and upper part of the body are visible. The whole is inclosed in a plain but handsome oak casket with silver handles, which the ambassador had made. Our engraving shows the appearance of the latter, containing the body, as it was exposed for a day or two at the Medical College. Only a few persons specially authorized by the embassy were admitted to view the remains, as it was not intended to make a public celebration of the event before obtaining advice from America in regard to the matter. The writer is indebted to the courtesy of Col. Bailly-Blanchard for the permission to take the present photograph for the SCIENTIFIC AMERICAN. The embassy had some photographs of the body taken, but these are to be kept as documents, and it is not intended to have them published, at least at present. The casket is draped with two large American flags, with small flags and palm-branches on the top. The remains are to be placed in a vault in the American church in Paris until it is decided what steps are to be taken for bringing them to America. It is probable that the American and French governments will come to accord for a great celebration in honor of the admiral, which will take place in French waters, and it is likely that the American cruiser squadron will come over to take the body back to the United States some time in June.



PAUL JONES SHOOTING A SAILOR WHO HAD ATTEMPTED TO STRIKE HIS COLORS IN AN ENGAGEMENT.

After an old print (1780) from the original picture by John Collet.

Aluminium Paper for Wrapping.

M. Riché, member of the Council of Hygiene of the Seine Department (France) has recently made a number of observations regarding aluminium foil and paper coated with aluminium powder as regards the preserving of the alimentary substances which may be wrapped in them. The percentage of foreign matter was found to be small, upon analysis of different samples. Iron is sometimes found to the extent of two per cent. The samples contained no arsenic or toxic metals. The aluminium powders used for the paper are comparatively pure, but sometimes contain alumina. The coated paper is manufactured in Germany. The base is an artificial parchment obtained by treating paper with sulphuric acid as usual. The sheets are spread out and upon one side is applied a thin layer of solution of resin in alcohol or ether. Evaporation is hastened by a current of air, then the paper is heated until the resin softens again. Powder of aluminium is then sprinkled on, and the whole is placed under strong pressure to give the adherence. The coating is not attacked by the air or by fatty bodies. The paper thus prepared is much cheaper than tin-foil. As regards the aluminium foil, up to the present the foil has been rather stiff and hard, but the manufacturers are now making a very thin foil. By a combination of rolling and mechanical beating they now prepare as many as 3,000 sheets together, and the thickness is as low as 1-2,500 inch. The sheets are as soft as tin-foil, which up to the present is the only one used for chocolate and confectionery. The price of the aluminium sheets of the above thickness is 7 francs the kilogramme ($0.64 per pound) in France, and at least 80 square yards per pound. This question presents a great interest from a commercial and a hygienic standpoint. According to M. Riché, the coated paper does not give a complete protection, as cracks or holes are apt to form and the air and moisture penetrate into the interior. However, the air does not enter rapidly, seeing that a piece of chloride of calcium wrapped in the paper was only liquefied after six days. While the tin-foil is usually harmless, we must not forget that tin is now obtained from old cans or boxes, and may thus contain lead, and again lead is sometimes added to make it cheaper. The police regulations in Paris do not allow more than one-half per cent of lead in the tin-foil. If aluminium paper and foil can be prepared so that it will not crack and will follow the surface of the objects exactly, it will no doubt be a serious competitor of tin-foil, not only as regards cheapness, but also hygienic value.

The Postmaster-General of Great Britain has made provisional arrangements with the Marconi International Marine Communication Company for the acceptance and prepayment at telegraph offices in the United Kingdom of telegrams for transmission from wireless stations on the coast to ships at sea. The arrangement came into operation on January 1.

A NEW TYPE OF WATCH DEMAGNETIZER.

BY A. FREDERICK COLLINS.

To the widely-extended use of high-potential currents for lighting, transmission, and power purposes may be traced a large percentage of the disorders which are now so universally found in afflicted watches. This is due to the magnetization of the delicate mechanisms which go to make up the works of these timepieces, and it is this vexatious cause which renders their perfect operation impossible.

From the above statements it must not be inferred that magnetized watches are to be found only in the possession of the engineer and electrician, or those whose work brings them into close proximity with electric currents.

On the contrary, the watch carried by the minister, lawyer, doctor, and everyone else, whether it is a dollar Waterbury or the most expensive Swiss movement, is just as likely to fall under the untoward influence of a magnetic field, and so become inaccurate, and when this is the case the most careful adjustment will fail to set it right.

The hairspring of a watch is especially susceptible to any stray magnetic lines of force, and when magnetized it is no longer free in its movements, as designed by the maker, for the turns will attract each other and retard the speed of the train of wheels; in consequence of this ailment, jewelers are constantly confronted with watches that will not "keep time," and in nine cases out of ten the cause is traced to the effects of magnetism, hence the necessity of equipping the shop with a demagnetizer, so that this erratic and troublesome element may be eliminated. The fundamental principle upon which the demagnetization of watches is based is, that the latter shall be drawn through a rapidly-alternating magnetic field; and where a single or multiphase current is available, the apparatus usually consists of a solenoid and a contact key.

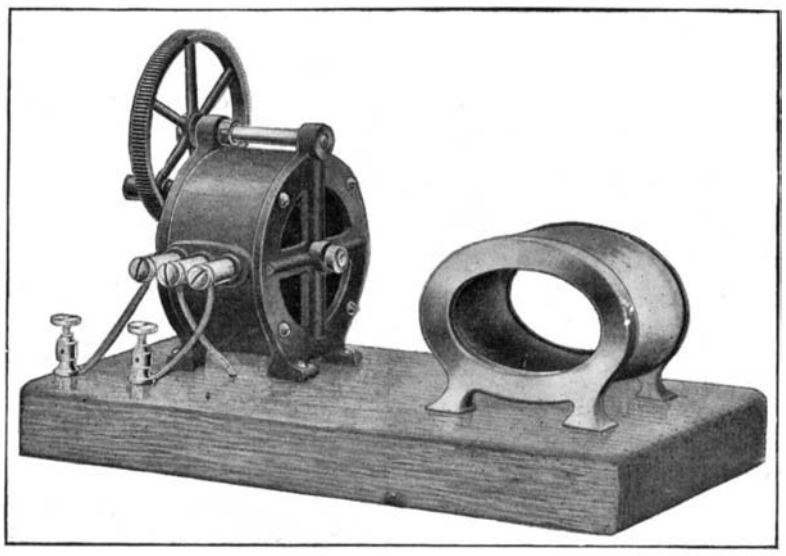
The new Knoblock-Heideman apparatus, shown in the illustration, may be used with either an alternating or direct current. Assuming that the watchmaker has an alternating current available, then the instrument consists of a solenoid, oval in form and wound with double-covered insulated magnet wire, the terminals of which are brought out to a spring contact key; now, when this device is connected by a flexible conductor cord and screw plug to an ordinary incandescent lamp socket carrying an alternating current, and pressure is applied to the spring key, the circuit is closed, and the current then flows through the solenoid, setting up inside the coil a very powerful alternating magnetic field.

The watch or tool to be demagnetized is now drawn slowly through the solenoid several times, when it will be found that all previous magnetic effects have entirely disappeared. The instrument operates better when energized by a single-phase alternating current, but it is quite efficient on polyphase currents. After the current is permitted to flow by pressure on the contact key, the article is withdrawn to a distance of say two feet from the instrument, and then the current is broken. The instrument is wound for currents of from 50 to 150 volts.

The direct-current demagnetizer comprises a solenoid with brass metal-plated end supports similar to the one just described, but it is also provided with a pole-changer operated by a crank through gears to give the proper rotative speed, and by this means produce reversals of the direct current which is taken from a lamp socket connected with the lighting circuit.

The turning of the crank and pole-changer transfers the direct or constant current into an alternating current, which, as we have seen, is necessary for the purpose of demagnetizing steel. When it is desired to treat a watch or tool, the object is inserted in the solenoid, and the pole-changer is operated during the time the object is slowly withdrawn from the solenoid, until it is at a safe distance, when the current is turned off at the lamp socket.

The demagnetizer is mounted on a wooden base, which can be screwed to a bench, thereby leaving both ends free to use in the process of eliminating the magnetism. The instrument is wound for from 100 to 220 volts. The construction of the machine is simple, there is no danger of its getting out of order, and properly used it will accomplish the desired result every time.



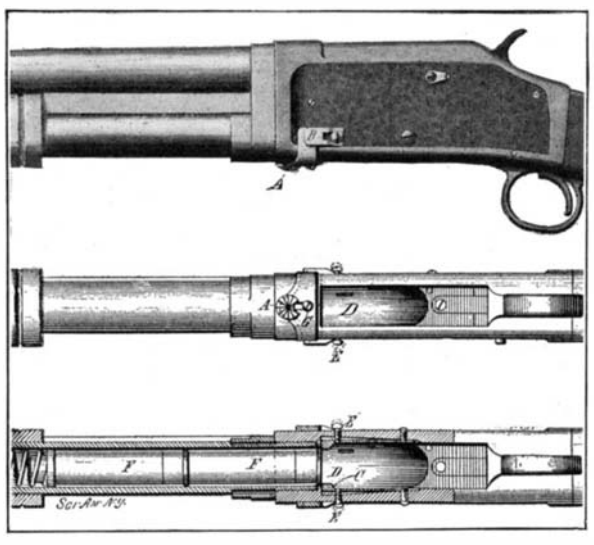
WATCH DEMAGNETIZER FOR DIRECT CURRENT.

Prize for a Safe Method of Cutting Diamonds.

In order to render the industry of diamond cutting more healthy to the operatives than it is at present the Netherlands government has instituted a competition. The object is to discover a process of cutting diamonds which will dispense with the present use of an alloy which is so dangerous to health. For a complete solution of this problem a prize of $2,375 is offered. The answers must be written in either the English, Dutch, German, or French language and must be submitted to Prof. L. Aronstein, Chemical Laboratory of the Polytechnic School, Delft, Holland, on or before January 1, 1906.

IMPROVEMENT IN MAGAZINE FIREARMS.

In magazine firearms as usually constructed, the loaded shells are stored in a tube below the barrel of the gun, from which they are fed back by a spiral spring, and introduced into the barrel by the pumping motion of a sleeve sliding on the tubular magazine. After the gun is fired, the sleeve must again be reciprocated to discharge the empty shell and bring the new loaded shell to position. The accompanying engraving illustrates an arrangement whereby the magazine can be unloaded in a safe and expeditious manner without any pumping action, and without dropping the loaded shells. The improvement saves a great deal of unnecessary wear on the firing mechanism. A yoke embraces the lower edge of the frame just in front of the opening in which the breech block *D* plays. The screw *G*, which fastens the yoke in place, passes through a slot therein, thus permitting slight longitudinal reciprocation of the yoke. The two branches of the yoke curve upwardly around the frame, and carry at their ends two cam fingers *B*, which are slotted to pass under the heads of the screws *E*. These screws extend through the side walls of the frame, and are rigidly connected to the forward ends of two flat-springs *C*. The forward ends of these springs are formed with lugs, which normally rest against the rim of the rearmost shell in the magazine, and prevent it from being thrown to the rear under pressure of the magazine spring. When, however, the yoke is slipped forward, the cams *B* move the screws *E* out and with them the springs *C*, thereby removing the lugs from engagement with the rim of the shell. The loaded shell is then free to pass out of the magazine into the hand. To prevent unintentional movement of the yoke, a button *A* is pivoted thereto, which normally bears against the screw head *G*, thus locking the yoke against movement. But this button is cut away on one side, so that when this side is turned to face the screw, as shown in the illustration, the yoke may be slid to the rear, permitting removal of the loaded shell. Mr. William B. Atkinson, of Bowling Green, Ky., is the inventor of this improvement.



AN IMPROVED MAGAZINE FIREARM.

Horological Exposition at Nuremberg.

On the occasion of the unveiling of the memorial to Peter Henlein, the inventor of the watch, which event is to take place some time during the coming June, the German Watchmakers' Association will open an exhibition of ancient and modern watches which will clearly show the entire development of the watch from its origin to the present day. The exposition is to last from the 15th of June to the 15th of August.

A Washing Soap That Prevents Lead, Copper, and Mercury Poisoning.

Painters, whitewashers, varnishers, and in general workmen who handle compositions of which lead is an ingredient, will sooner or later suffer from lead poisoning. Despite the most scrupulous cleaning, the hand will retain some traces of the lead, which ultimately find their way to the mouth in eating, drinking, or smoking. The ordinary soap may, chemically considered, be one of the most deplorable cleansing agents, for the chemical combinations to which it may give rise when applied to paint-stained hands may even increase the amount of lead adhering to the skin.

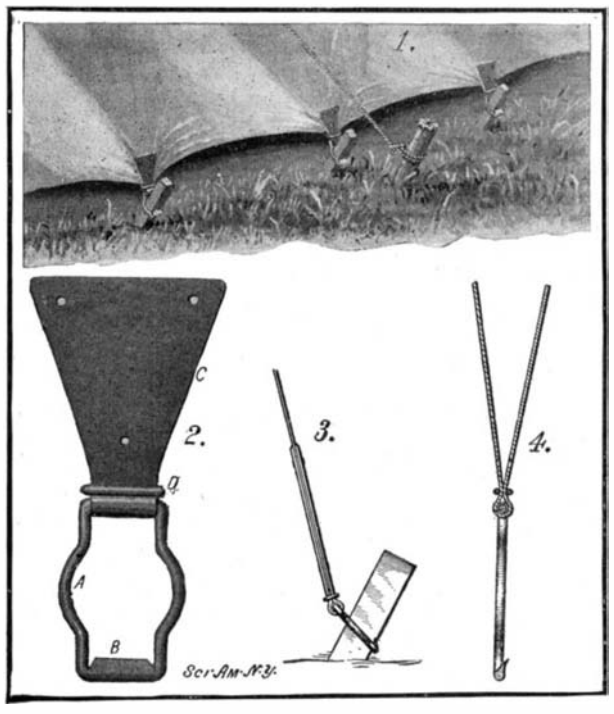
A German chemist has invented a soap for the purpose of so acting upon the lead adhering to the skin as to render it absolutely harmless. The particles of lead are changed into non-poisonous sulphide of lead by the simple process of washing with this soap.

The chemical principle underlying the use of this soap is simple enough. It consists simply in producing sulphureted hydrogen, which transforms the lead into harmless sulphide of lead, and renders it possible to cleanse the skin thoroughly. In washing the lead-stained hands with the soap, the skin becomes brown—evidence of the presence of lead. The brown color is readily removed by a thorough cleaning with the brush, and the skin loses the odor of sulphureted hydrogen. The soap itself is agreeable to the smell.

To the chemist it is obvious that a soap of this kind ought to be effective, not only for the purpose of preventing poisoning from lead, but from copper, mercury, and arsenic as well; for these, too, can be converted into innocuous sulphides.

TENT FASTENER.

Campers are liable to experience considerable difficulty in anchoring the side walls of a tent against displacement by wind or other forces. The usual rope loops fastened to the canvas are apt to tear out, and a makeshift arrangement is often used for anchoring the tent by driving the peg through the canvas, with the result that the rent is made larger and the material becomes badly torn. To obviate these difficulties in a simple manner, Mr. John Blair, Jr., of Rock Springs, Wyoming, has invented the improved tent fastener illustrated herewith. It consists of a metal link, *A*, which is suspended from a loop of leather, *C*. The loop may be sewed to the bottom of the tent wall, or the canvas may be inserted between the two leaves of the loop, and these leaves then fastened together with rivets, as shown in the drawing. The loop is kept tight upon the link by an eyelet, *D*, which prevents the parts from becoming separated and mislaid when the fastener is not attached to the tent. The lower bar of the link is preferably formed with a blade or knife-edge, *B*, adapted to sink into the peg, as shown in Fig. 3, and thus prevent the fastener from slipping off. The anchor pegs are preferably driven in at an angle, and are provided with a slight notch to receive the blade. The pegs usually furnished with tents are of substantially rectangular cross section, as illustrated, but when these are lost rough-cut pegs are often employed, and in order to adapt the links to their use, the side bars of the links are bowed out, as shown in Fig. 2.



TENT FASTENER.

A patent for a water-wheel was recently issued to Mr. Theodore R. Timby, of Brooklyn. His first patent, also for a water-wheel, was dated November 10, 1846.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

TROLLEY-POLE CATCHER.—J. H. WALKER, Lexington, Ky. When the trolley-wheel jumps the wire in the novel construction provided by this inventor the pole will be prevented from rising to a perpendicular position. The manipulation of the trolley-pole is easy, as the pole can be caught at any angle desired and prevented from pulling too hard against the conductor or other operator manipulating the same when turning the pole from end to end of the car. Time is saved in starting cars out of barns and in leaving cars in the barn or on the track, as the pole can be easily pulled down by the cord a short distance below the conductor-wire and quickly dogged.

Of Interest to Farmers.

SPRAYER FOR THE WOUNDS OF ANIMALS.—MARY F. HAVENS, New York, N. Y. The purpose of this invention is to provide a device for spraying heavy oils, ointments, and emulsions upon the wounds of cattle, horses, and all animals without causing the wounds to bleed or to be unduly irritated and without frightening the animals under treatment. The device may be operated by the mouth of the operator without danger of any of the liquid returning to where the lips are applied.

VARIABLE COUNTERPOISE FOR GATES.—J. HAWKESWORTH, New York, N. Y., and R. A. MCCULLOCH, Orange, N. J. According to Mr. Hawkesworth's present invention his purpose is the provision of a variable counterpoise for any form of gate intended to open by pivotal movement in a vertical plane or a counterpoise for any equivalent object intended for similar movement.

DEVICE FOR THE BREAKING IN OF HORSES.—H. SCHLUETER, Scribner, Neb. One purpose of this improvement is to provide a readily-controllable vehicle especially adapted for breaking in colts or wild horses to harness, the arrangement of the vehicle being such as to accommodate one or two unbroken animals only or one or two unbroken animals together with one or two animals previously broken to harness. Steering the vehicle and manipulating the brakes simultaneously with reference to the front and rear trucks is conveniently done.

OPERATING MECHANISM FOR GATES.—J. E. STIRTON, Monroe, Wash. In this mechanism the lever-ring may be made at a very slight expense and shipped cheaply, adapting it to be sold at a low price and applied by the purchaser to gates which are already in place. It furnishes what amounts to a continuous wheel having all the strength necessary to transmit the moving force and yet applicable to an erected structure.

GATE.—C. W. VAN DE WALKER and R. T. JENNEY, Two Rivers, Wis. By this effective mechanism the gate may be operated in either direction from either side by a person in a vehicle and at either of its extreme positions it will not only be locked by the catch provided, but will be held by the tension of the spring which assists in opening or closing it. The gate and its operating mechanism are extremely simple and durable.

HARROW AND CULTIVATOR.—J. A. BEARD, SR., Liberty, Miss. In the present case the object of the invention is to simplify the construction and reduce the cost of the combination harrow and cultivator for which Mr. Beard, Sr., obtained a former Letters Patent. The principal feature of this invention is the special means employed for locking the shanks of the shovels or other cultivating devices so that they are prevented from turning to the side or laterally in the direction in which the leverage due to draft is mainly applied.

Of General Interest.

TANK-CLEANER.—J. W. BIVINS, Topeka, Kan. The inventor has devised and applied a simple apparatus by which tanks may be cleaned quickly and with little labor and loss of but a small quantity of water. The invention includes improved means for effecting the mechanical loosening of the sediment and for washing out the same or discharging it from the tank, likewise an attachment for the top of a tank which serves as a support for the shaft of the rotary plow or scraper by which the sediment is loosened and also for the workman who operates such scrapers.

FOUNTAIN-BRUSH.—P. H. CLINGAN, Florence, Col. The intention in this instance is to provide a can of very simple form which is so constructed as to prevent the possibility of spilling the contents thereof. The can includes a wick of absorbent material which is constantly supplied with oil or other fluid within the can. The invention relates to fountain-brushes and oil-cans or similar receptacles for lubricating or polishing fluids.

HYDRAULIC COUPLING.—J. J. DELEHANT, Chicago, Ill. In this patent the invention has reference to hydraulic couplings, and more particularly to a type of coupling suitable for fastening hose to hydrants, for coupling hose-sections together, and for general service where a pipe or tube of any kind is to be quickly coupled with a member through which water is to flow.

INVALID BEDSTEAD.—W. C. FEELY, New York, N. Y. One of the purposes of this improvement is to provide an adjustable bedstead and a commode practically constituting a portion of the bed and means whereby the commode may be adjusted up and down or in direction of either side of the bed, all of the said adjustments being capable of accomplishment by the manipulation of a single lever or operating member.

RESPIRATOR.—W. G. GATES, Fort Benton, Mont. This invention pertains to respirators. The present device is readily adjusted to the face, and does not in any way interfere with the vision of the wearer, nor does it prevent the use of spectacles or goggles at the same time. A marked advantage is in the use of cotton-batting instead of sponge. It is more sanitary, comfortable and convenient to the wearer of the respirator, it does not freeze in cold weather, and is more potent to catch fine dust.

CAP.—H. SEIDE, New York, N. Y. This cap is an improvement, particularly on the general type worn by automobilists, bicycle-riders, and the like, the object of the inventor being to provide a cap so constructed that it may be readily changed to present different colors or textures, thus practically providing a plurality of caps in a single structure.

THREAD CUTTER AND TIER.—J. B. UNDERWOOD, Fayetteville, N. C. The inventor has made an improvement in hand-manipulated implements which relates to cutting and tying the ends of strands or threads, and is particularly adapted for tying spool ends, an object being to provide a device of this character by means of which two ends of a broken thread may be quickly tied and evenly cut without materially interfering with the operation of the spool.

FLUE OR TUBE CUTTER.—R. T. MILLER, Defiance, Ohio. The inventor employs a hollow body in which works an adjustable stem, having at one end a specially-constructed head. A set of laterally-movable blocks is co-operatively organized with body and head, each provided with a cutter, with a set of devices mounted upon the body for rotating the structure. A solid longitudinal extension is employed at one end of body, having a pilot for supporting the structure within a tube or flue to be cut. The invention relates to rotary flue or tube cutters.

FOLDING TABLE.—J. A. CRANDALL, New York, N. Y. To the standard of the table legs are hinged to fold inward in close relation and to the fixed center of the table top radial leaves are hinged. Connections are provided between the upper ends of the legs, and a sliding sleeve on the standard, the leaves being connected also to the sleeve at the upper end of the latter by means of braces, their construction being such that when the legs are folded inward the table leaves are automatically folded into lowered position, whereby the table is brought into compact form.

FOUNTAIN-PEN.—R. A. HAMILTON, Seymour, Conn. In this instance the invention refers to fountain-pens and more especially to self-filling pens having a compressible reservoir. The object of the inventor is to provide improved means for compressing the reservoir which shall be compact and effective to empty the reservoir without requiring undue manipulation or distortion of the reservoir.

BOX.—J. J. POLSKI, Duluth, Minn. The improvement refers to a box which is capable of general use, but is especially applicable for holding beer-bottles. The object of the invention is to provide a box which will be strong and durable without materially increasing the cost of manufacture and which will be especially adapted for the purpose of holding beer-bottles and the like.

Machines and Mechanical Devices.

MACHINE FOR INSERTING DIAGONAL STRANDS IN WOVEN CANE FABRICS.—F. H. JANSON, New York, N. Y. Means are provided for depressing the warp-strands and raising the weft-strands in woven cane fabric for the passage of a needle carrying a diagonal strand, by this inventor. He accomplishes his object by an up-and-down movement of bars carrying guide-pins, which pins have projections for depressing the strands, and serve in action to hold the fabric in position and to separate the weft from the warp while the diagonal strands are inserted and at the same time rectify inaccuracies in the weave.

MINERAL-VANNER.—H. C. KRAUSE, Point Mills, Mich. The improvement pertains to concentrators and separators for ores and other minerals; and its object is to provide a vanner, very simple, durable, effective, and readily adjustable for treating different minerals, and arranged to insure a quick concentration and separation of the valuable minerals from the tailings.

Pertaining to Vehicles.

SHORT HARNESS-TRACE.—D. K. BELLIS, Manton, Mich. Of the several objects in view of this inventor one is the provision of a simple, strong, and durable short metallic trace in which the metallic parts are protected on one side to prevent chafing the animal and to overcome wrinkling or displacement of the protective layer with relation to such metallic parts.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of the paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 6788.—For manufacturers of milk bottles made of paper.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 6789.—Wanted, a twelve string guitar in which the guitar is of the six string model, but having two strings together like a mandolin.

Perforated Metals, Harrington & King Perforating Co., Chicago.

Inquiry No. 6790.—For manufacturers of machines for making lead pencils.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 6791.—For manufacturers of a small rubber ball generally sold at retail for two cents and known as rebounding rubber ball.

Adding, multiplying and dividing machine, all in one. Felt & Tarrant Mfg. Co., Chicago.

Inquiry No. 6792.—For manufacturers of small rubber tubing in 24-inch lengths.

Commercially pure nickel tube, manufactured by The Standard Welding Co., Cleveland, O.

Inquiry No. 6793.—For manufacturers of silver, German silver and brass plate, in sheets of about the thickness of medium to heavy tin; also silver and German silver wire.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 6794.—Wanted, information regarding air pumps, such as are used for pumping air from a tin barrel tank.

Braze Cast Iron. See our advertisement in this paper. The A. & J. Mfg. Co., 9 S. Canal St., Chicago.

Inquiry No. 6795.—For manufacturers of material for making scrotum supporters, buckles, cloth straps, etc.

Drying Machinery (Rotary Direct Heat or Steam) and Filter Presses. Biles Drier Co., Louisville, Ky.

Inquiry No. 6796.—For manufacturers of refrigerating machines in which chemicals are used in place of ice to lower the temperature sufficiently for keeping food sweet.

I sell patents. To buy them on anything, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

Inquiry No. 6797.—For manufacturers of spring motors having at least ½ h. p.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company, Foot of East 138th Street, New York.

Inquiry No. 6798.—For manufacturers of hardened spring steel balls, 15/8 inches in diameter, weighing 1½ ounces.

Gut strings for Lawn Tennis, Musical Instruments, and other purposes made by P. F. Turner, 46th Street and Packers Avenue, Chicago, Ill.

Inquiry No. 6799.—For manufacturers of tools used in making pipe coils.

We manufacture iron and steel forgings, from twenty pounds to twenty-five tons. Crank shafts of all varieties. Erie Forge Company, Erie, Pa.

Inquiry No. 6800.—For manufacturers of churn power which can be applied to the dash and run of its own accord

Models, dies, boxes, metal stampings, patent articles, novelties, manufactured and sold. Printing on aluminum. U. S. Novelty Co., Lily Dale, N. Y.

Inquiry No. 6801.—Wanted, hollow leather throats for filling out corners in castings.

Have you found a manufacturer for your invention? Write now and send samples. New York Die and Model Works, 508 Pearl Street, New York.

Inquiry No. 6802.—For manufacturers of lead pipe making machinery.

We Manufacture on Contract anything in light Hardware. Write us for estimates. Edmonds-Metzel Mfg. Co., 143-153 South Jefferson Street, Chicago.

Inquiry No. 6803.—Wanted, address of parties weaving cotton tubing in 24-inch lengths or longer.

WANTED.—An engineer experienced in the design, construction and use of gasoline motors for automobiles. Address J. F., Box 773, New York.

Inquiry No. 6804.—Wanted, address of parties making or selling spring motors.

FOR SALE.—Patent on tent fastener. Just out. Every tent needs it. Simple of construction. For information address John Blair, Jr., Rock Springs, Wyoming.

Inquiry No. 6805.—For manufacturers of small chains, like bicycle chains, small enough to take place of tape which operates typewriter carriages.

WANTED.—Colonial silverware. Any one wishing to sell any authentic silver made in this country during the eighteenth century, please communicate with C. A. M., Box 773, New York.

Inquiry No. 6806.—For parties having good rubber reclaiming process.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 6807.—Wanted, address of violin maker's tools.

You can rent a well equipped private laboratory by day, week or month from Electrical Testing Laboratories. 548 East 80th Street, New York. Absolute privacy. Ask for terms and facilities.

Inquiry No. 6808.—For firms in United States manufacturing apparatus for the dry distillation of wood, for producing alcohol, charcoal and other products.

Space with power, heat, light and machinery, if desired, in a large New England manufacturing concern, having more room than is necessary for their business. Address Box No. 407, Providence, R. I.

Inquiry No. 6809.—For manufacturers of machines making shipping tags.

The SCIENTIFIC AMERICAN SUPPLEMENT has published a practical series of nine illustrated articles on experimental electro-chemistry by N. Monroe Hopkins. The SUPPLEMENT numbers in which these articles are to be found are 1509, 1511, 1513, 1515, 1517, 1519, 1521, 1523, 1525. Each SUPPLEMENT costs ten cents by mail. Munn & Co., 361 Broadway, New York.

Inquiry No. 6810.—Wanted, address of manufacturer or dealer in water glass.

Splendid opening for a high-grade mechanical engineer, who has had a broad experience in managing machine shops, the manufacture of machinery, engines and metal specialties. Applicants must be in prime of life and now employed. Preference will be given to applicants who have had modern scientific training in mechanical schools of high standing. Unqualified references will be exacted. All communications received will be regarded as strictly confidential. Address

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HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

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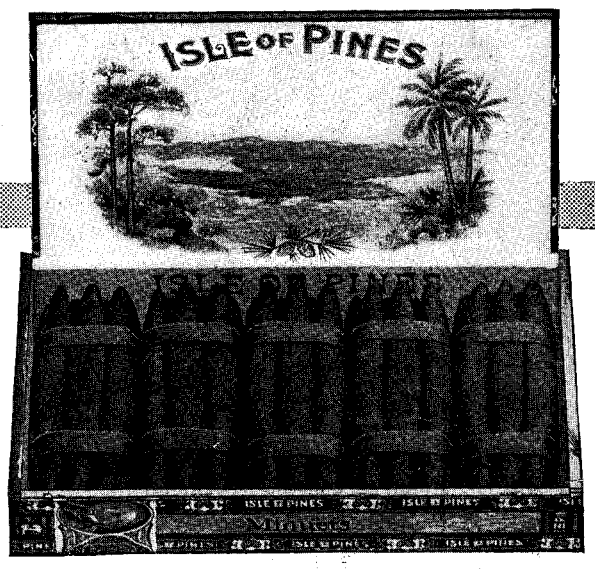
Minerals sent for examination should be distinctly marked or labeled.

(9626) W. B. C. says: Will you kindly state in your notes and queries column a process for treating wood for open fireplaces so that it will burn with colored flame? Also the substances used to make a slow-burning colored fire? A. In a pail of water put 4 ounces copper chloride, and soak the wood in this solution. When dry it will burn with a green flame. Zinc chloride and strontium chloride may be added, giving bluish and red flames mixed with the green. A slow-burning green fire may be made by mixing potassium chlorate 36 parts, barium nitrate 40 parts, and sulphur 24 parts. For a red flame use potassium chlorate 40 parts, strontium nitrate 39 parts, sulphur 18 parts, lampblack 3 parts. These formulas are from the "Scientific American Cyclopedia of Receipts," which contains many others, besides thousands of valuable receipts. We send it for $5.

(9627) C. A. G. asks: A D and C B are parallel horizontal planes, X is a 40-65 Winchester rifle. The distance A C is one foot and is vertical. Now a bullet is shot from the gun X, and the instant the bullet passes point A, another bullet (same size, etc.) is dropped from this same point, i. e., A. Will both bullets strike the ground within one-tenth of a second of each other? Besides answering this question, I wish you would give me the data from which you derive your answer. A. Both bullets in the case proposed will strike the level plane below at the same instant, not within a tenth second of each other. The reason is that the bullet which is shot from the gun falls by gravity as readily and as much as one which is dropped from the same point at the same time. The law of motion which covers this case is stated as follows: "A given force produces the same effect whether it acts upon a body at rest or in motion, whether it acts alone or at the same time as other forces." One force acts in the line AC, gravity; two forces act upon the ball which is shot from the gun, the force of the powder and gravity, to cause it to pursue the path AB in the same time as the other ball passes through AC.

(9628) G. W. S. says: Assume an air-pipe of considerable length, say 100 feet, open at its ends. Apply an air-pump of 10 pounds force at one end. Air will pass through the pipe because of a pressure at the inlet of 25 pounds against 15 pounds pressure at the outlet. Transfer the pump to the other end of the pipe, and use it as a suction pump. Again air will pass, in the same direction, due to a pressure at the inlet of 15 pounds and an outlet pressure of 10 pounds. The latter arrangement is alleged to be the more efficient. Why so, since in each case apparently the actual moving force is the superior pressure at the inlet end, and there is the same difference of pressure at the ends? If there is no difference in efficiency, wherein lies the acknowledged great economy in an exhaust steam heating system, wherein a suction pump is placed at the tail of the system, as against a force pump of the same power placed at the head of the system and supplementing the power of the exhaust piston? Apparently here also the actual moving force in each case is a "push." A steam heating book uses the simile of pushing and pulling a rope—apparently an inaccurate one. A. There is no difference in efficiency between pumping air through a pipe and drawing it through by suction. The work required to move the same quantity of air at the same velocity will be the same in either case. The idea that you have regarding the greater efficiency of a vacuum steam-heating



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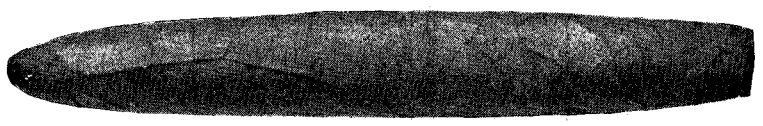

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system is correct, but for a very different reason. The great difficulty with steam-heating systems is that air gets into the pipes and radiators, and is difficult to dislodge by the circulation of steam under pressure. By means of an air pump, producing a slight vacuum in the entire system, however, there is no difficulty in keeping the system free from air, and having every part of the heating surface effective.

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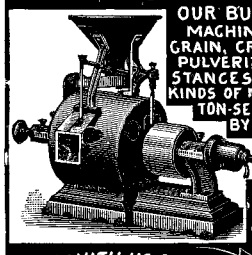

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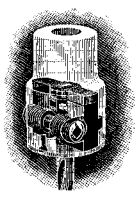

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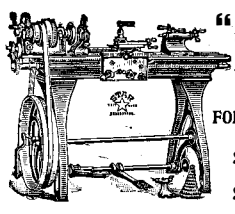

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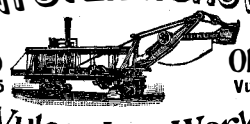

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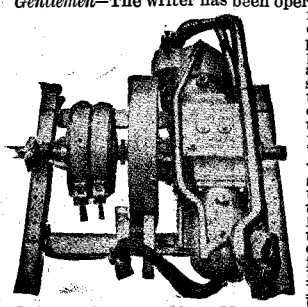

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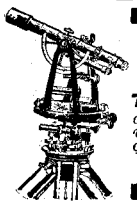

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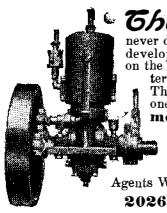

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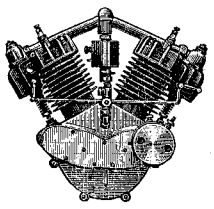

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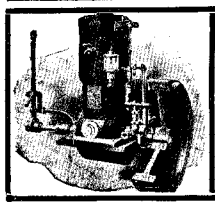

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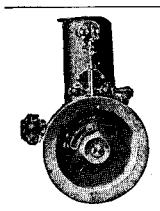

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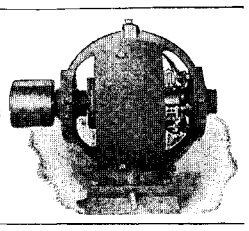

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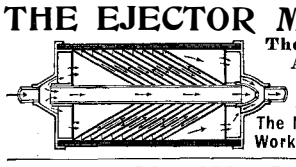

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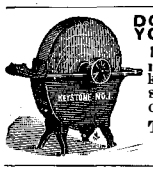

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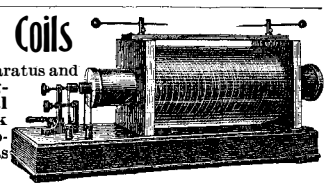

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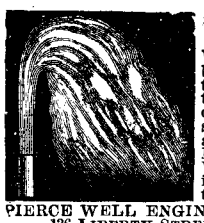

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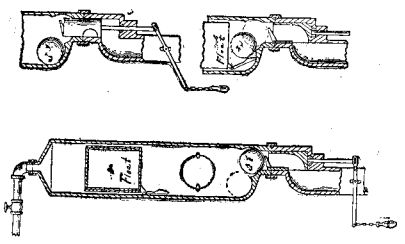

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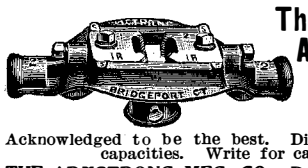

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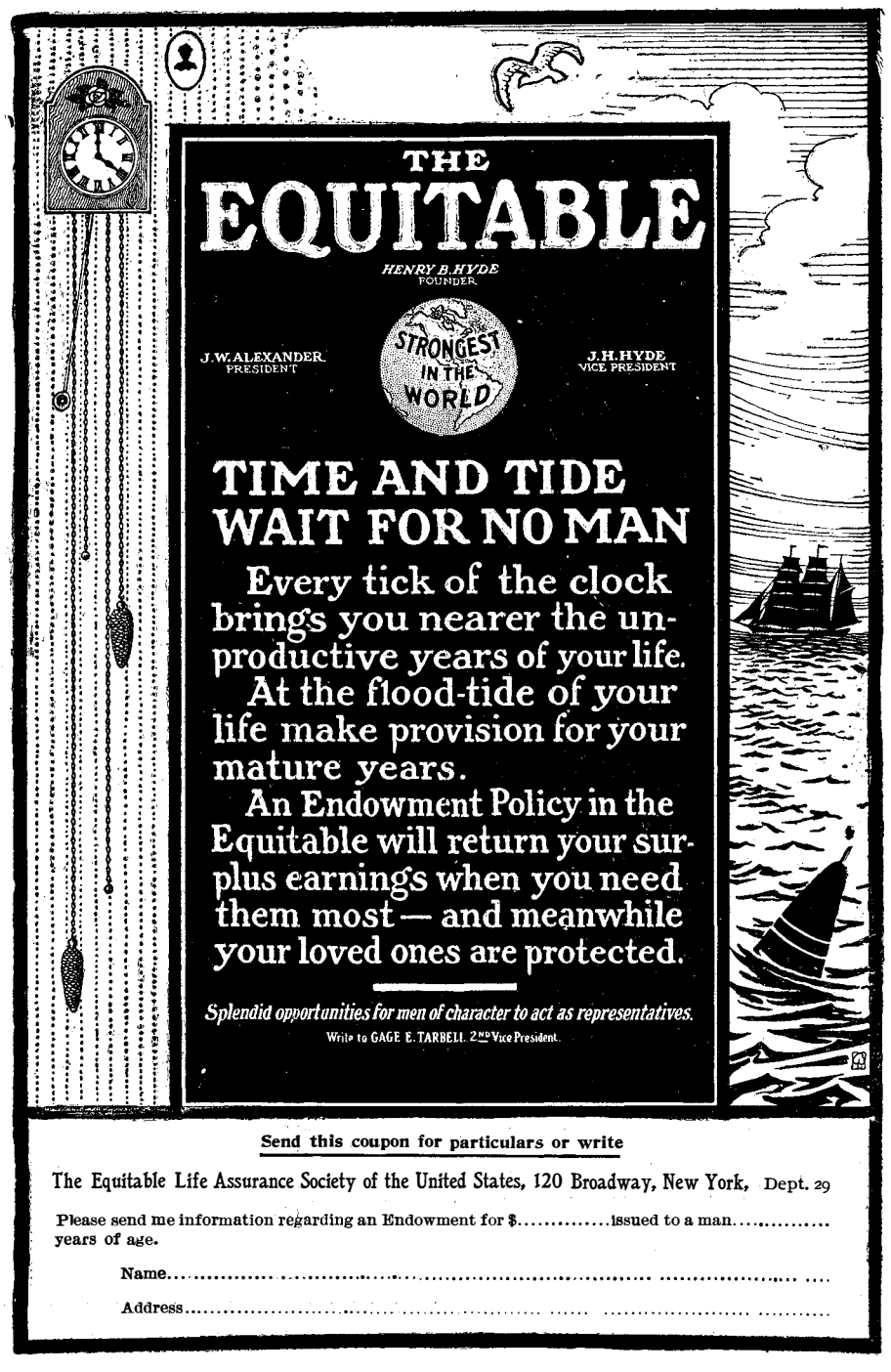
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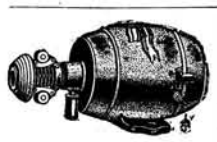

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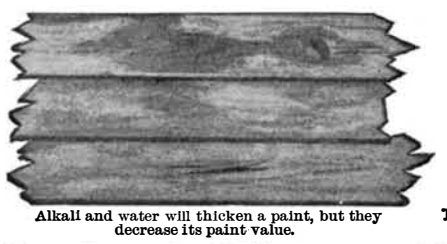

Alkali and water will thicken a paint, but they decrease its paint value.

The watered paints would settle, like the adulterated semi-pastes, were it not for the thickening.

Paint Frauds Exposed

A good paint looks well and wears well. Most paints look well for a while, but only those made of the right ingredients—in the right proportions—wear well.

Short-lived paints are the hand-mixed mixtures, and the adulterated, thick-looking watered paints.

Of all paint deceptions, watered paints are the worst. Water has no paint value. It not only displaces oil, but, far worse, its presence in paint proves that an alkali has been used to make the water and oil mix.

This union of oil and water forms a thick emulsion which holds in suspension cheap adulterating pigments that would otherwise become hard and settle in the bottom of the can. The alkali destroys the oil and when the oil is destroyed the paint is dead and chalks and is blown or shaken from the building.

The water in many so-called pure paints makes them look thick and this deception sells them.

Another class of paints to shun are the semi-paste paints that cannot be marketed in liquid form. They are composed largely of cheap adulterants and in liquid form would "settle and cake;" it requires a thick, semi-paste to keep these mixtures from separating.

Patton's Sun-Proof Paints look right and wear well for five years and more. They are composed of Zinc, Lead and Silica, Linseed Oil and Turpentine driers in the right proportions. They are cheap because they are good.

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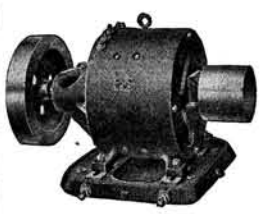

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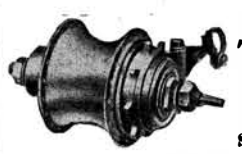

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SPECIAL ANNOUNCEMENT

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American Homes and Gardens

Successor to SCIENTIFIC AMERICAN BUILDING MONTHLY

THIS new monthly magazine will be much broader in scope than its predecessor. It will have the word "HOME" for its keynote. The man to whom this word has no meaning will have no interest in this new publication. It is the intention of the Editor to take the reader with him to various parts of the country, and show him how the better class of people live, whether the house may have cost $3,000 or $300,000. Good taste is, perhaps, more necessary in the building and furnishing of a house of small cost than in a mansion of importance.

The Editor will not leave you on the outer doorstep, however, but will take you within, where you may see how the house is furnished and decorated, and how the owners live. Then you may have a walk through the garden, and then to the summer house, where, perhaps, the plan of the formal garden culminates.

There will be published articles on room decoration and furnishing, showing how the furniture may be arranged to produce the best effects, what pictures may be hung, and what bric-à-brac, inherited from some former mansion, may with advantage be discarded.

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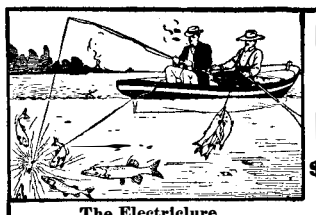

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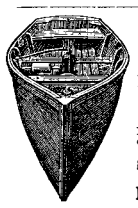

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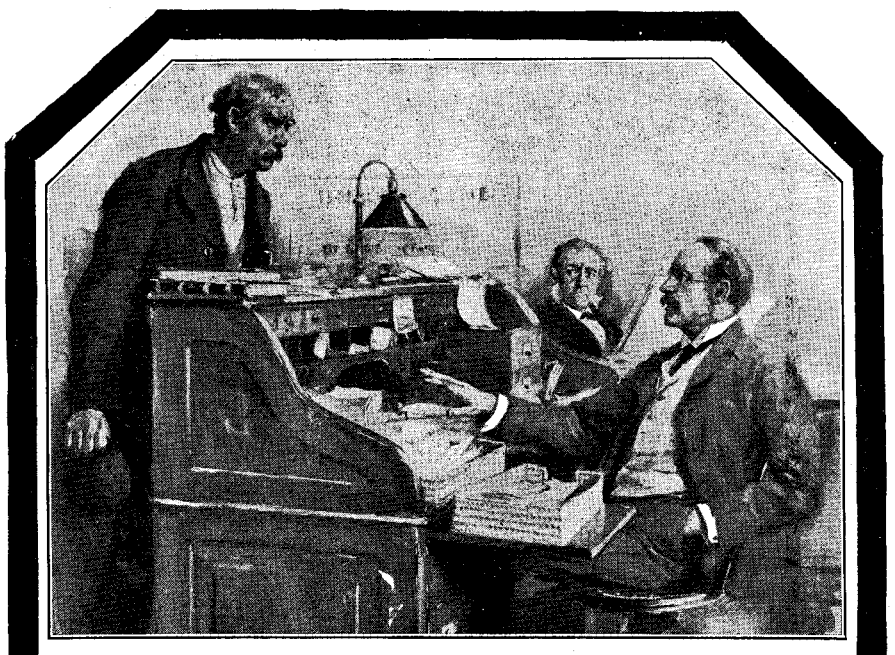

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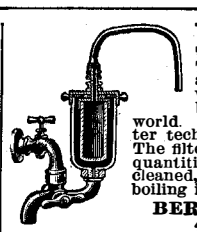

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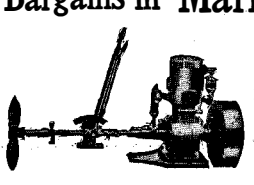

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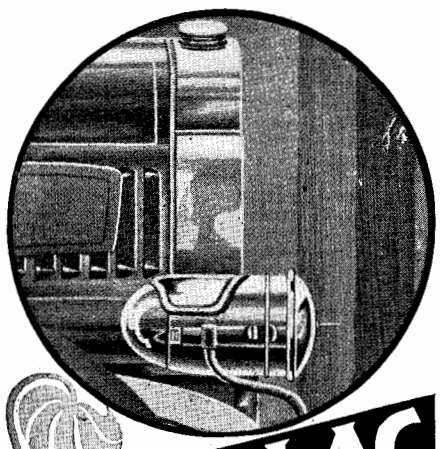

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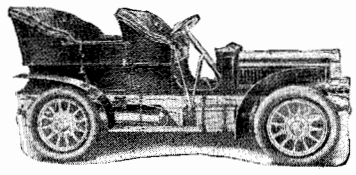

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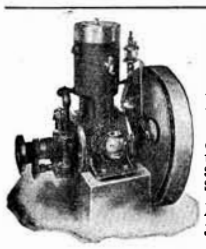

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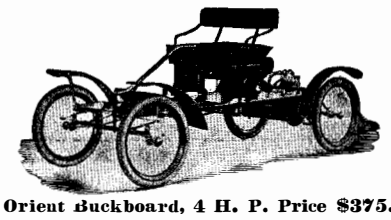

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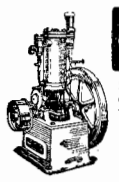

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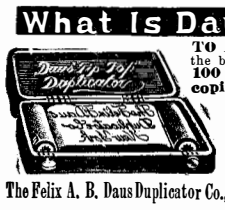

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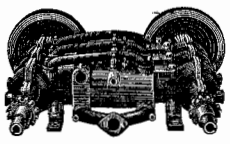

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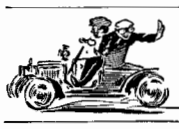

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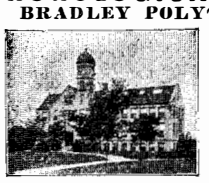

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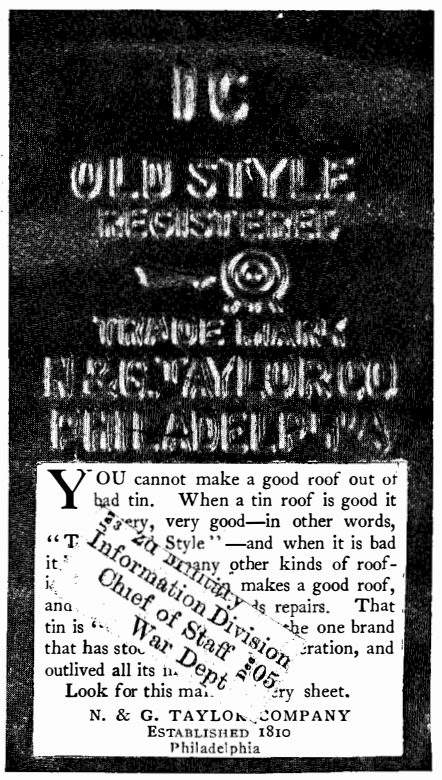

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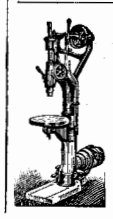

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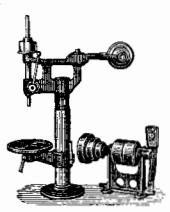

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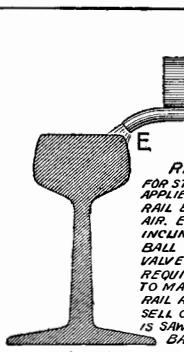

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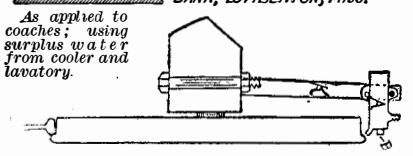

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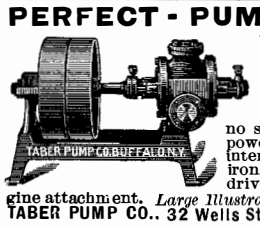

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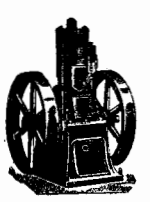

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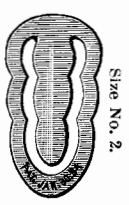

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